SEQUENCE LISTING

<110> Duvick, Jonathan P.
Gilliam, Jacob T.
Maddox, Joyce R.
Crasta, Oswald R.
Folkerts, Otto

<120> Amino Polyol Amine Oxidase
Polynucleotides and Related Polypeptides and Methods of Use

<130> 0875C

<150> US 60/092,936
<151> 1998-07-15

<150> US 09/352,168
<151> 1999-07-12

<160> 33

<170> FastSEQ for Windows Version 3.0

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<212> DNA
<213> Exophiala spinifera.

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attgtcgatc gacgtcgatg ctggtatctc tggcaaatga gatggggtca cagctcgatt 180
ggaggacgcc cgagaagcct tgttcgcgcc accacggctt gtcccatacg aagactatct 240
tgctatagta gcccaggata gaattttccg ccaatgcttg cttctcggcg ggaagaggtg 300
gtgaaaatgt caaggtggga tacaaggttg tcggtaacga aaccancacc tttttgcttc 360
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tacaaggttg tcggtaacga aaccaccacc tttttgcttc ggaacacggc gcccgaggcc 120
gatcgtactg tacagccgga tgccgactgc tcaatttcag cgacgggggt gttgaggtgc 180
ac 182

<210> 3
<211> 29
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<213> Artificial Sequence

<220>

<223> Designed oligonucleotide for 3' RACE, N21965

<400> 3
tggtttcgtt accgacaacc ttgtatccc 29

<210> 4
<211> 28
<212> DNA
<213> Artificial Sequence

<220>
<223> Desiged oligonucleotide for 5' RACE, N21968

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gagttggtcc cagacagact tttgtcgt 28

<210> 5
<211> 1389
<212> DNA
<213> Exophiala spinifera

<220>
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<222> (1)...(1386)

<400> 5

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Asp Asn Val Ala Asp Val Val Val Val Gly Ala Gly Leu Ser Gly Leu
 1               5                  10                  15

gag acg gca cgc aaa gtc cag gcc gcc ggt ctg tcc tgc ctc gtt ctt      96
Glu Thr Ala Arg Lys Val Gln Ala Ala Gly Leu Ser Cys Leu Val Leu
            20                  25                  30

gag gcg atg gat cgt gta ggg gga aag act ctg agc gta caa tcg ggt     144
Glu Ala Met Asp Arg Val Gly Gly Lys Thr Leu Ser Val Gln Ser Gly
        35                  40                  45

ccc ggc agg acg act atc aac gac ctc ggc gct gcg tgg atc aat gac     192
Pro Gly Arg Thr Thr Ile Asn Asp Leu Gly Ala Ala Trp Ile Asn Asp
    50                  55                  60

agc aac caa agc gaa gta tcc aga ttg ttt gaa aga ttt cat ttg gag     240
Ser Asn Gln Ser Glu Val Ser Arg Leu Phe Glu Arg Phe His Leu Glu
65                  70                  75                  80

ggc gag ctc cag agg acg act gga aat tca atc cat caa gca caa gac     288
Gly Glu Leu Gln Arg Thr Thr Gly Asn Ser Ile His Gln Ala Gln Asp
                85                  90                  95

ggt aca acc act aca gct cct tat ggt gac tcc ttg ctg agc gag gag     336
Gly Thr Thr Thr Thr Ala Pro Tyr Gly Asp Ser Leu Leu Ser Glu Glu
            100                 105                 110

gtt gca agt gca ctt gcg gaa ctc ctc ccc gta tgg tct cag ctg atc     384
Val Ala Ser Ala Leu Ala Glu Leu Leu Pro Val Trp Ser Gln Leu Ile
        115                 120                 125

gaa gag cat agc ctt caa gac ctc aag gcg agc cct cag gcg aag cgg     432
Glu Glu His Ser Leu Gln Asp Leu Lys Ala Ser Pro Gln Ala Lys Arg
    130                 135                 140
```

```
ctc gac agt gtg agc ttc gcg cac tac tgt gag aag gaa cta aac ttg      480
Leu Asp Ser Val Ser Phe Ala His Tyr Cys Glu Lys Glu Leu Asn Leu
145                 150                 155                 160

cct gct gtt ctc ggc gta gca aac cag atc aca cgc gct ctg ctc ggt      528
Pro Ala Val Leu Gly Val Ala Asn Gln Ile Thr Arg Ala Leu Leu Gly
                165                 170                 175

gtg gaa gcc cac gag atc agc atg ctt ttt ctc acc gac tac atc aag      576
Val Glu Ala His Glu Ile Ser Met Leu Phe Leu Thr Asp Tyr Ile Lys
            180                 185                 190

agt gcc acc ggt ctc agt aat att ttc tcg gac aag aaa gac ggc ggg      624
Ser Ala Thr Gly Leu Ser Asn Ile Phe Ser Asp Lys Lys Asp Gly Gly
        195                 200                 205

cag tat atg cga tgc aaa aca ggt atg cag tcg att tgc cat gcc atg      672
Gln Tyr Met Arg Cys Lys Thr Gly Met Gln Ser Ile Cys His Ala Met
    210                 215                 220

tca aag gaa ctt gtt cca ggc tca gtg cac ctc aac acc ccc gtc gct      720
Ser Lys Glu Leu Val Pro Gly Ser Val His Leu Asn Thr Pro Val Ala
225                 230                 235                 240

gaa att gag cag tcg gca tcc ggc tgt aca gta cga tcg gcc tcg ggc      768
Glu Ile Glu Gln Ser Ala Ser Gly Cys Thr Val Arg Ser Ala Ser Gly
                245                 250                 255

gcc gtg ttc cga agc aaa aag gtg gtg gtt tcg tta ccg aca acc ttg      816
Ala Val Phe Arg Ser Lys Lys Val Val Val Ser Leu Pro Thr Thr Leu
            260                 265                 270

tat ccc acc ttg aca ttt tca cca cct ctt ccc gcc gag aag caa gca      864
Tyr Pro Thr Leu Thr Phe Ser Pro Pro Leu Pro Ala Glu Lys Gln Ala
        275                 280                 285

ttg gcg gaa aat tct atc ctg ggc tac tat agc aag ata gtc ttc gta      912
Leu Ala Glu Asn Ser Ile Leu Gly Tyr Tyr Ser Lys Ile Val Phe Val
    290                 295                 300

tgg gac aag ccg tgg tgg cgc gaa caa ggc ttc tcg ggc gtc ctc caa      960
Trp Asp Lys Pro Trp Trp Arg Glu Gln Gly Phe Ser Gly Val Leu Gln
305                 310                 315                 320

tcg agc tgt gac ccc atc tca ttt gcc aga gat acc agc atc gac gtc     1008
Ser Ser Cys Asp Pro Ile Ser Phe Ala Arg Asp Thr Ser Ile Asp Val
                325                 330                 335

gat cga caa tgg tcc att acc tgt ttc atg gtc gga gac ccg gga cgg     1056
Asp Arg Gln Trp Ser Ile Thr Cys Phe Met Val Gly Asp Pro Gly Arg
            340                 345                 350

aag tgg tcc caa cag tcc aag cag gta cga caa aag tct gtc tgg gac     1104
Lys Trp Ser Gln Gln Ser Lys Gln Val Arg Gln Lys Ser Val Trp Asp
        355                 360                 365

caa ctc cgc gca gcc tac gag aac gcc ggg gcc caa gtc cca gag ccg     1152
Gln Leu Arg Ala Ala Tyr Glu Asn Ala Gly Ala Gln Val Pro Glu Pro
    370                 375                 380

gcc aac gtg ctc gaa atc gag tgg tcg aag cag cag tat ttc caa gga     1200
Ala Asn Val Leu Glu Ile Glu Trp Ser Lys Gln Gln Tyr Phe Gln Gly
```

```
385                 390                 395                 400

gct ccg agc gcc gtc tat ggg ctg aac gat ctc atc aca ctg ggt tcg     1248
Ala Pro Ser Ala Val Tyr Gly Leu Asn Asp Leu Ile Thr Leu Gly Ser
                405                 410                 415

gcg ctc aga acg ccg ttc aag agt gtt cat ttc gtt gga acg gag acg     1296
Ala Leu Arg Thr Pro Phe Lys Ser Val His Phe Val Gly Thr Glu Thr
            420                 425                 430

tct tta gtt tgg aaa ggg tat atg gaa ggg gcc ata cga tcg ggt caa     1344
Ser Leu Val Trp Lys Gly Tyr Met Glu Gly Ala Ile Arg Ser Gly Gln
        435                 440                 445

cga ggt gct gca gaa gtt gtg gct agc ctg gtg cca gca gca             1386
Arg Gly Ala Ala Glu Val Val Ala Ser Leu Val Pro Ala Ala
    450                 455                 460

tag                                                                 1389
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<210> 6
<211> 462
<212> PRT
<213> Exophiala spinifera

<400> 6

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Asp Asn Val Ala Asp Val Val Val Val Gly Ala Gly Leu Ser Gly Leu
 1               5                  10                  15
Glu Thr Ala Arg Lys Val Gln Ala Ala Gly Leu Ser Cys Leu Val Leu
            20                  25                  30
Glu Ala Met Asp Arg Val Gly Gly Lys Thr Leu Ser Val Gln Ser Gly
        35                  40                  45
Pro Gly Arg Thr Thr Ile Asn Asp Leu Gly Ala Ala Trp Ile Asn Asp
    50                  55                  60
Ser Asn Gln Ser Glu Val Ser Arg Leu Phe Glu Arg Phe His Leu Glu
65                  70                  75                  80
Gly Glu Leu Gln Arg Thr Thr Gly Asn Ser Ile His Gln Ala Gln Asp
                85                  90                  95
Gly Thr Thr Thr Thr Ala Pro Tyr Gly Asp Ser Leu Leu Ser Glu Glu
            100                 105                 110
Val Ala Ser Ala Leu Ala Glu Leu Leu Pro Val Trp Ser Gln Leu Ile
        115                 120                 125
Glu Glu His Ser Leu Gln Asp Leu Lys Ala Ser Pro Gln Ala Lys Arg
    130                 135                 140
Leu Asp Ser Val Ser Phe Ala His Tyr Cys Glu Lys Glu Leu Asn Leu
145                 150                 155                 160
Pro Ala Val Leu Gly Val Ala Asn Gln Ile Thr Arg Ala Leu Leu Gly
                165                 170                 175
Val Glu Ala His Glu Ile Ser Met Leu Phe Leu Thr Asp Tyr Ile Lys
            180                 185                 190
Ser Ala Thr Gly Leu Ser Asn Ile Phe Ser Asp Lys Lys Asp Gly Gly
        195                 200                 205
Gln Tyr Met Arg Cys Lys Thr Gly Met Gln Ser Ile Cys His Ala Met
    210                 215                 220
Ser Lys Glu Leu Val Pro Gly Ser Val His Leu Asn Thr Pro Val Ala
225                 230                 235                 240
Glu Ile Glu Gln Ser Ala Ser Gly Cys Thr Val Arg Ser Ala Ser Gly
                245                 250                 255
Ala Val Phe Arg Ser Lys Lys Val Val Val Ser Leu Pro Thr Thr Leu
            260                 265                 270
Tyr Pro Thr Leu Thr Phe Ser Pro Pro Leu Pro Ala Glu Lys Gln Ala
        275                 280                 285
```

```
Leu Ala Glu Asn Ser Ile Leu Gly Tyr Tyr Ser Lys Ile Val Phe Val
    290                 295                 300
Trp Asp Lys Pro Trp Trp Arg Glu Gln Gly Phe Ser Gly Val Leu Gln
305                 310                 315                 320
Ser Ser Cys Asp Pro Ile Ser Phe Ala Arg Asp Thr Ser Ile Asp Val
                325                 330                 335
Asp Arg Gln Trp Ser Ile Thr Cys Phe Met Val Gly Asp Pro Gly Arg
            340                 345                 350
Lys Trp Ser Gln Gln Ser Lys Gln Val Arg Gln Lys Ser Val Trp Asp
        355                 360                 365
Gln Leu Arg Ala Ala Tyr Glu Asn Ala Gly Ala Gln Val Pro Glu Pro
    370                 375                 380
Ala Asn Val Leu Glu Ile Glu Trp Ser Lys Gln Gln Tyr Phe Gln Gly
385                 390                 395                 400
Ala Pro Ser Ala Val Tyr Gly Leu Asn Asp Leu Ile Thr Leu Gly Ser
                405                 410                 415
Ala Leu Arg Thr Pro Phe Lys Ser Val His Phe Val Gly Thr Glu Thr
            420                 425                 430
Ser Leu Val Trp Lys Gly Tyr Met Glu Gly Ala Ile Arg Ser Gly Gln
        435                 440                 445
Arg Gly Ala Ala Glu Val Val Ala Ser Leu Val Pro Ala Ala
    450                 455                 460
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<210> 7
<211> 1442
<212> DNA
<213> Exophiala spinifera

<220>
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<222> (1)...(646)

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<400> 7

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Asp Asn Val Ala Asp Val Val Val Val Gly Ala Gly Leu Ser Gly Leu
 1               5                  10                  15

gag acg gca cgc aaa gtc cag gcc gcc ggt ctg tcc tgc ctc gtt ctt       96
Glu Thr Ala Arg Lys Val Gln Ala Ala Gly Leu Ser Cys Leu Val Leu
            20                  25                  30

gag gcg atg gat cgt gta ggg gga aag act ctg agc gta caa tcg ggt      144
Glu Ala Met Asp Arg Val Gly Gly Lys Thr Leu Ser Val Gln Ser Gly
        35                  40                  45

ccc ggc agg acg act atc aac gac ctc ggc gct gcg tgg atc aat gac      192
Pro Gly Arg Thr Thr Ile Asn Asp Leu Gly Ala Ala Trp Ile Asn Asp
    50                  55                  60

agc aac caa agc gaa gta tcc aga ttg ttt gaa aga ttt cat ttg gag      240
Ser Asn Gln Ser Glu Val Ser Arg Leu Phe Glu Arg Phe His Leu Glu
65                  70                  75                  80

ggc gag ctc cag agg acg act gga aat tca atc cat caa gca caa gac      288
Gly Glu Leu Gln Arg Thr Thr Gly Asn Ser Ile His Gln Ala Gln Asp
                85                  90                  95
```

```
ggt aca acc act aca gct cct tat ggt gac tcc ttg ctg agc gag gag      336
Gly Thr Thr Thr Thr Ala Pro Tyr Gly Asp Ser Leu Leu Ser Glu Glu
            100                 105                 110

gtt gca agt gca ctt gcg gaa ctc ctc ccc gta tgg tct cag ctg atc      384
Val Ala Ser Ala Leu Ala Glu Leu Leu Pro Val Trp Ser Gln Leu Ile
        115                 120                 125

gaa gag cat agc ctt caa gac ctc aag gcg agc cct cag gcg aag cgg      432
Glu Glu His Ser Leu Gln Asp Leu Lys Ala Ser Pro Gln Ala Lys Arg
    130                 135                 140

ctc gac agt gtg agc ttc gcg cac tac tgt gag aag gaa cta aac ttg      480
Leu Asp Ser Val Ser Phe Ala His Tyr Cys Glu Lys Glu Leu Asn Leu
145                 150                 155                 160

cct gct gtt ctc ggc gta gca aac cag atc aca cgc gct ctg ctc ggt      528
Pro Ala Val Leu Gly Val Ala Asn Gln Ile Thr Arg Ala Leu Leu Gly
                165                 170                 175

gtg gaa gcc cac gag atc agc atg ctt ttt ctc acc gac tac atc aag      576
Val Glu Ala His Glu Ile Ser Met Leu Phe Leu Thr Asp Tyr Ile Lys
            180                 185                 190

agt gcc acc ggt ctc agt aat att ttc tcg gac aag aaa gac ggc ggg      624
Ser Ala Thr Gly Leu Ser Asn Ile Phe Ser Asp Lys Lys Asp Gly Gly
        195                 200                 205

cag tat gtg cga tgc aaa aca g gtgcgtgtgg tgtcgtctca ggtgggggac      676
Gln Tyr Val Arg Cys Lys Thr
    210                 215

tcgtttctca gtggtcattc cag gt atg cag tcg att tgc cat gcc atg tca      728
                        Gly Met Gln Ser Ile Cys His Ala Met Ser
                                    220                 225

aag gaa ctt gtt cca ggc tca gtg cac ctc aac acc ccc gtc gct gaa      776
Lys Glu Leu Val Pro Gly Ser Val His Leu Asn Thr Pro Val Ala Glu
                230                 235                 240

att gag cag tcg gca tcc ggc tgt aca gta cga tcg gcc tcg ggc gcc      824
Ile Glu Gln Ser Ala Ser Gly Cys Thr Val Arg Ser Ala Ser Gly Ala
            245                 250                 255

gtg ttc cga agc aaa aag gtg gtg gtt tcg tta ccg aca acc ttg tat      872
Val Phe Arg Ser Lys Lys Val Val Val Ser Leu Pro Thr Thr Leu Tyr
        260                 265                 270

ccc acc ttg aca ttt tca cca cct ctt ccc gcc gag aag caa gca ttg      920
Pro Thr Leu Thr Phe Ser Pro Pro Leu Pro Ala Glu Lys Gln Ala Leu
    275                 280                 285

gcg gaa aat tct atc ctg ggc tac tat agc aag ata gtc ttc gta tgg      968
Ala Glu Asn Ser Ile Leu Gly Tyr Tyr Ser Lys Ile Val Phe Val Trp
290                 295                 300                 305

gac aag ccg tgg tgg cgc gaa caa ggc ttc tcg ggc gtc ctc caa tcg     1016
Asp Lys Pro Trp Trp Arg Glu Gln Gly Phe Ser Gly Val Leu Gln Ser
                310                 315                 320

agc tgt gac ccc atc tca ttt gcc aga gat acc agc atc gac gtc gat     1064
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Ser Cys Asp Pro Ile Ser Phe Ala Arg Asp Thr Ser Ile Asp Val Asp
            325                 330                 335

cga caa tgg tcc att acc tgt ttc atg gtc gga gac ccg gga cgg aag     1112
Arg Gln Trp Ser Ile Thr Cys Phe Met Val Gly Asp Pro Gly Arg Lys
        340                 345                 350

tgg tcc caa cag tcc aag cag gta cga caa aag tct gtc tgg gac caa     1160
Trp Ser Gln Gln Ser Lys Gln Val Arg Gln Lys Ser Val Trp Asp Gln
    355                 360                 365

ctc cgc gca gcc tac gag aac gcc ggg gcc caa gtc cca gag ccg gcc     1208
Leu Arg Ala Ala Tyr Glu Asn Ala Gly Ala Gln Val Pro Glu Pro Ala
370                 375                 380                 385

aac gtg ctc gaa atc gag tgg tcg aag cag cag tat ttc caa gga gct     1256
Asn Val Leu Glu Ile Glu Trp Ser Lys Gln Gln Tyr Phe Gln Gly Ala
                390                 395                 400

ccg agc gcc gtc tat ggg ctg aac gat ctc atc aca ctg ggt tcg gcg     1304
Pro Ser Ala Val Tyr Gly Leu Asn Asp Leu Ile Thr Leu Gly Ser Ala
            405                 410                 415

ctc aga acg ccg ttc aag agt gtt cat ttc gtt gga acg gag acg tct     1352
Leu Arg Thr Pro Phe Lys Ser Val His Phe Val Gly Thr Glu Thr Ser
        420                 425                 430

tta gtt tgg aaa ggg tat atg gaa ggg gcc ata cga tcg ggt caa cga     1400
Leu Val Trp Lys Gly Tyr Met Glu Gly Ala Ile Arg Ser Gly Gln Arg
    435                 440                 445

ggt gct gca gaa gtt gtg gct agc ctg gtg cca gca gca tag              1442
Gly Ala Ala Glu Val Val Ala Ser Leu Val Pro Ala Ala
450                 455                 460
```

<210> 8
<211> 462
<212> PRT
<213> Exophiala spinifera

<400> 8

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Asp Asn Val Ala Asp Val Val Val Val Gly Ala Gly Leu Ser Gly Leu
 1               5                  10                  15
Glu Thr Ala Arg Lys Val Gln Ala Ala Gly Leu Ser Cys Leu Val Leu
            20                  25                  30
Glu Ala Met Asp Arg Val Gly Gly Lys Thr Leu Ser Val Gln Ser Gly
        35                  40                  45
Pro Gly Arg Thr Thr Ile Asn Asp Leu Gly Ala Ala Trp Ile Asn Asp
    50                  55                  60
Ser Asn Gln Ser Glu Val Ser Arg Leu Phe Glu Arg Phe His Leu Glu
65                  70                  75                  80
Gly Glu Leu Gln Arg Thr Thr Gly Asn Ser Ile His Gln Ala Gln Asp
                85                  90                  95
Gly Thr Thr Thr Thr Ala Pro Tyr Gly Asp Ser Leu Leu Ser Glu Glu
            100                 105                 110
Val Ala Ser Ala Leu Ala Glu Leu Leu Pro Val Trp Ser Gln Leu Ile
        115                 120                 125
Glu Glu His Ser Leu Gln Asp Leu Lys Ala Ser Pro Gln Ala Lys Arg
    130                 135                 140
Leu Asp Ser Val Ser Phe Ala His Tyr Cys Glu Lys Glu Leu Asn Leu
145                 150                 155                 160
```

```
Pro Ala Val Leu Gly Val Ala Asn Gln Ile Thr Arg Ala Leu Leu Gly
                165                 170                 175
Val Glu Ala His Glu Ile Ser Met Leu Phe Leu Thr Asp Tyr Ile Lys
            180                 185                 190
Ser Ala Thr Gly Leu Ser Asn Ile Phe Ser Asp Lys Lys Asp Gly Gly
        195                 200                 205
Gln Tyr Val Arg Cys Lys Thr Gly Met Gln Ser Ile Cys His Ala Met
    210                 215                 220
Ser Lys Glu Leu Val Pro Gly Ser Val His Leu Asn Thr Pro Val Ala
225                 230                 235                 240
Glu Ile Glu Gln Ser Ala Ser Gly Cys Thr Val Arg Ser Ala Ser Gly
                245                 250                 255
Ala Val Phe Arg Ser Lys Lys Val Val Val Ser Leu Pro Thr Thr Leu
            260                 265                 270
Tyr Pro Thr Leu Thr Phe Ser Pro Pro Leu Pro Ala Glu Lys Gln Ala
        275                 280                 285
Leu Ala Glu Asn Ser Ile Leu Gly Tyr Tyr Ser Lys Ile Val Phe Val
    290                 295                 300
Trp Asp Lys Pro Trp Trp Arg Glu Gln Gly Phe Ser Gly Val Leu Gln
305                 310                 315                 320
Ser Ser Cys Asp Pro Ile Ser Phe Ala Arg Asp Thr Ser Ile Asp Val
                325                 330                 335
Asp Arg Gln Trp Ser Ile Thr Cys Phe Met Val Gly Asp Pro Gly Arg
            340                 345                 350
Lys Trp Ser Gln Gln Ser Lys Gln Val Arg Gln Lys Ser Val Trp Asp
        355                 360                 365
Gln Leu Arg Ala Ala Tyr Glu Asn Ala Gly Ala Gln Val Pro Glu Pro
    370                 375                 380
Ala Asn Val Leu Glu Ile Glu Trp Ser Lys Gln Gln Tyr Phe Gln Gly
385                 390                 395                 400
Ala Pro Ser Ala Val Tyr Gly Leu Asn Asp Leu Ile Thr Leu Gly Ser
                405                 410                 415
Ala Leu Arg Thr Pro Phe Lys Ser Val His Phe Val Gly Thr Glu Thr
            420                 425                 430
Ser Leu Val Trp Lys Gly Tyr Met Glu Gly Ala Ile Arg Ser Gly Gln
        435                 440                 445
Arg Gly Ala Ala Glu Val Val Ala Ser Leu Val Pro Ala Ala
    450                 455                 460
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<210> 9
<211> 458
<212> PRT
<213> Exophiala spinifera

<400> 9

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            20                  25                  30
Glu Ala Met Asp Arg Val Gly Gly Lys Thr Leu Ser Val Gln Ser Gly
        35                  40                  45
Pro Gly Arg Thr Thr Ile Asn Asp Leu Gly Ala Ala Trp Ile Asn Asp
    50                  55                  60
Ser Asn Gln Ser Glu Val Ser Arg Leu Phe Glu Arg Phe His Leu Glu
65                  70                  75                  80
Gly Glu Leu Gln Arg Thr Thr Gly Asn Ser Ile His Gln Ala Gln Asp
                85                  90                  95
Gly Thr Thr Thr Thr Ala Pro Tyr Gly Asp Ser Leu Leu Ser Glu Glu
            100                 105                 110
Val Ala Ser Ala Leu Ala Glu Leu Leu Pro Val Trp Ser Gln Leu Ile
        115                 120                 125
Glu Glu His Ser Leu Gln Asp Leu Lys Ala Ser Pro Gln Ala Lys Arg
```

```
    130                 135                 140
Leu Asp Ser Val Ser Phe Ala His Tyr Cys Glu Lys Glu Leu Asn Leu
145                 150                 155                 160
Pro Ala Val Leu Gly Val Ala Asn Gln Ile Thr Arg Ala Leu Leu Gly
                165                 170                 175
Val Glu Ala His Glu Ile Ser Met Leu Phe Leu Thr Asp Tyr Ile Lys
            180                 185                 190
Ser Ala Thr Gly Leu Ser Asn Ile Phe Ser Asp Lys Lys Asp Gly Gly
        195                 200                 205
Gln Tyr Val Arg Cys Lys Thr Gly Ala Cys Gly Val Val Ser Gly Gly
    210                 215                 220
Gly Leu Val Ser Gln Trp Ser Phe Gln Val Cys Ser Arg Phe Ala Met
225                 230                 235                 240
Pro Cys Gln Arg Asn Leu Phe Gln Ala Gln Cys Thr Ser Thr Pro Pro
                245                 250                 255
Ser Leu Lys Leu Ser Ser Arg His Pro Ala Val Gln Tyr Asp Arg Pro
            260                 265                 270
Arg Ala Pro Cys Ser Glu Ala Lys Arg Trp Trp Phe Arg Tyr Arg Gln
        275                 280                 285
Pro Cys Ile Pro Pro His Phe His His Leu Phe Pro Pro Arg Ser Lys
    290                 295                 300
His Trp Arg Lys Ile Leu Ser Trp Ala Thr Ile Ala Arg Ser Ser Tyr
305                 310                 315                 320
Gly Thr Ser Arg Gly Gly Ala Asn Lys Ala Ser Arg Ala Ser Ser Asn
                325                 330                 335
Arg Ala Val Thr Pro Ser His Leu Pro Glu Ile Pro Ala Ser Thr Ser
            340                 345                 350
Ile Asp Asn Gly Pro Leu Pro Val Ser Trp Ser Glu Thr Arg Asp Gly
        355                 360                 365
Ser Gly Pro Asn Ser Pro Ser Arg Tyr Asp Lys Ser Leu Ser Gly Thr
    370                 375                 380
Asn Ser Ala Gln Pro Thr Arg Thr Pro Gly Pro Lys Ser Gln Ser Arg
385                 390                 395                 400
Pro Thr Cys Ser Lys Ser Ser Gly Arg Ser Ser Ser Ile Ser Lys Glu
                405                 410                 415
Leu Arg Ala Pro Ser Met Gly Thr Ile Ser Ser His Trp Val Arg Arg
            420                 425                 430
Ser Glu Arg Arg Ser Arg Val Phe Ile Ser Leu Glu Arg Arg Arg Leu
        435                 440                 445
Phe Gly Lys Gly Ile Trp Lys Gly Pro Tyr
    450                 455
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<210> 10
<211> 1392
<212> DNA
<213> Exophiala spinifera

<220>
<221> CDS
<222> (1)...(1389)

<221> misc_feature
<222> (1)...(3)
<223> Extra lysine in K:trAPAO

<400> 10

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aaa gac aac gtt gcg gac gtg gta gtg gtg ggc gct ggc ttg agc ggt       48
Lys Asp Asn Val Ala Asp Val Val Val Val Gly Ala Gly Leu Ser Gly
 1               5                  10                  15

ttg gag acg gca cgc aaa gtc cag gcc gcc ggt ctg tcc tgc ctc gtt       96
Leu Glu Thr Ala Arg Lys Val Gln Ala Ala Gly Leu Ser Cys Leu Val
```

```
                20                  25                  30

ctt gag gcg atg gat cgt gta ggg gga aag act ctg agc gta caa tcg      144
Leu Glu Ala Met Asp Arg Val Gly Gly Lys Thr Leu Ser Val Gln Ser
         35                  40                  45

ggt ccc ggc agg acg act atc aac gac ctc ggc gct gcg tgg atc aat      192
Gly Pro Gly Arg Thr Thr Ile Asn Asp Leu Gly Ala Ala Trp Ile Asn
     50                  55                  60

gac agc aac caa agc gaa gta tcc aga ttg ttt gaa aga ttt cat ttg      240
Asp Ser Asn Gln Ser Glu Val Ser Arg Leu Phe Glu Arg Phe His Leu
 65                  70                  75                  80

gag ggc gag ctc cag agg acg act gga aat tca atc cat caa gca caa      288
Glu Gly Glu Leu Gln Arg Thr Thr Gly Asn Ser Ile His Gln Ala Gln
                 85                  90                  95

gac ggt aca acc act aca gct cct tat ggt gac tcc ttg ctg agc gag      336
Asp Gly Thr Thr Thr Thr Ala Pro Tyr Gly Asp Ser Leu Leu Ser Glu
            100                 105                 110

gag gtt gca agt gca ctt gcg gaa ctc ctc ccc gta tgg tct cag ctg      384
Glu Val Ala Ser Ala Leu Ala Glu Leu Leu Pro Val Trp Ser Gln Leu
        115                 120                 125

atc gaa gag cat agc ctt caa gac ctc aag gcg agc cct cag gcg aag      432
Ile Glu Glu His Ser Leu Gln Asp Leu Lys Ala Ser Pro Gln Ala Lys
    130                 135                 140

cgg ctc gac agt gtg agc ttc gcg cac tac tgt gag aag gaa cta aac      480
Arg Leu Asp Ser Val Ser Phe Ala His Tyr Cys Glu Lys Glu Leu Asn
145                 150                 155                 160

ttg cct gct gtt ctc ggc gta gca aac cag atc aca cgc gct ctg ctc      528
Leu Pro Ala Val Leu Gly Val Ala Asn Gln Ile Thr Arg Ala Leu Leu
                165                 170                 175

ggt gtg gaa gcc cac gag atc agc atg ctt ttt ctc acc gac tac atc      576
Gly Val Glu Ala His Glu Ile Ser Met Leu Phe Leu Thr Asp Tyr Ile
            180                 185                 190

aag agt gcc acc ggt ctc agt aat att ttc tcg gac aag aaa gac ggc      624
Lys Ser Ala Thr Gly Leu Ser Asn Ile Phe Ser Asp Lys Lys Asp Gly
        195                 200                 205

ggg cag tat atg cga tgc aaa aca ggt atg cag tcg att tgc cat gcc      672
Gly Gln Tyr Met Arg Cys Lys Thr Gly Met Gln Ser Ile Cys His Ala
    210                 215                 220

atg tca aag gaa ctt gtt cca ggc tca gtg cac ctc aac acc ccc gtc      720
Met Ser Lys Glu Leu Val Pro Gly Ser Val His Leu Asn Thr Pro Val
225                 230                 235                 240

gct gaa att gag cag tcg gca tcc ggc tgt aca gta cga tcg gcc tcg      768
Ala Glu Ile Glu Gln Ser Ala Ser Gly Cys Thr Val Arg Ser Ala Ser
                245                 250                 255

ggc gcc gtg ttc cga agc aaa aag gtg gtg gtt tcg tta ccg aca acc      816
Gly Ala Val Phe Arg Ser Lys Lys Val Val Val Ser Leu Pro Thr Thr
            260                 265                 270
```

```
ttg tat ccc acc ttg aca ttt tca cca cct ctt ccc gcc gag aag caa      864
Leu Tyr Pro Thr Leu Thr Phe Ser Pro Pro Leu Pro Ala Glu Lys Gln
        275                 280                 285

gca ttg gcg gaa aat tct atc ctg ggc tac tat agc aag ata gtc ttc      912
Ala Leu Ala Glu Asn Ser Ile Leu Gly Tyr Tyr Ser Lys Ile Val Phe
    290                 295                 300

gta tgg gac aag ccg tgg tgg cgc gaa caa ggc ttc tcg ggc gtc ctc      960
Val Trp Asp Lys Pro Trp Trp Arg Glu Gln Gly Phe Ser Gly Val Leu
305                 310                 315                 320

caa tcg agc tgt gac ccc atc tca ttt gcc aga gat acc agc atc gac     1008
Gln Ser Ser Cys Asp Pro Ile Ser Phe Ala Arg Asp Thr Ser Ile Asp
                325                 330                 335

gtc gat cga caa tgg tcc att acc tgt ttc atg gtc gga gac ccg gga     1056
Val Asp Arg Gln Trp Ser Ile Thr Cys Phe Met Val Gly Asp Pro Gly
            340                 345                 350

cgg aag tgg tcc caa cag tcc aag cag gta cga caa aag tct gtc tgg     1104
Arg Lys Trp Ser Gln Gln Ser Lys Gln Val Arg Gln Lys Ser Val Trp
        355                 360                 365

gac caa ctc cgc gca gcc tac gag aac gcc ggg gcc caa gtc cca gag     1152
Asp Gln Leu Arg Ala Ala Tyr Glu Asn Ala Gly Ala Gln Val Pro Glu
    370                 375                 380

ccg gcc aac gtg ctc gaa atc gag tgg tcg aag cag cag tat ttc caa     1200
Pro Ala Asn Val Leu Glu Ile Glu Trp Ser Lys Gln Gln Tyr Phe Gln
385                 390                 395                 400

gga gct ccg agc gcc gtc tat ggg ctg aac gat ctc atc aca ctg ggt     1248
Gly Ala Pro Ser Ala Val Tyr Gly Leu Asn Asp Leu Ile Thr Leu Gly
                405                 410                 415

tcg gcg ctc aga acg ccg ttc aag agt gtt cat ttc gtt gga acg gag     1296
Ser Ala Leu Arg Thr Pro Phe Lys Ser Val His Phe Val Gly Thr Glu
            420                 425                 430

acg tct tta gtt tgg aaa ggg tat atg gaa ggg gcc ata cga tcg ggt     1344
Thr Ser Leu Val Trp Lys Gly Tyr Met Glu Gly Ala Ile Arg Ser Gly
        435                 440                 445

caa cga ggt gct gca gaa gtt gtg gct agc ctg gtg cca gca gca         1389
Gln Arg Gly Ala Ala Glu Val Val Ala Ser Leu Val Pro Ala Ala
    450                 455                 460

tag                                                                1392
```

<210> 11
<211> 463
<212> PRT
<213> Exophiala spinifera

<220>
<223> Extra lysine in the polypeptide sequence of K:trAPAO, 463 aa.

<400> 11

```
Lys Asp Asn Val Ala Asp Val Val Val Val Gly Ala Gly Leu Ser Gly
 1               5                  10                  15
```

```
Leu Glu Thr Ala Arg Lys Val Gln Ala Ala Gly Leu Ser Cys Leu Val
            20                  25                  30
Leu Glu Ala Met Asp Arg Val Gly Gly Lys Thr Leu Ser Val Gln Ser
        35                  40                  45
Gly Pro Gly Arg Thr Thr Ile Asn Asp Leu Gly Ala Ala Trp Ile Asn
    50                  55                  60
Asp Ser Asn Gln Ser Glu Val Ser Arg Leu Phe Glu Arg Phe His Leu
65                  70                  75                  80
Glu Gly Glu Leu Gln Arg Thr Thr Gly Asn Ser Ile His Gln Ala Gln
                85                  90                  95
Asp Gly Thr Thr Thr Thr Ala Pro Tyr Gly Asp Ser Leu Leu Ser Glu
            100                 105                 110
Glu Val Ala Ser Ala Leu Ala Glu Leu Leu Pro Val Trp Ser Gln Leu
        115                 120                 125
Ile Glu Glu His Ser Leu Gln Asp Leu Lys Ala Ser Pro Gln Ala Lys
    130                 135                 140
Arg Leu Asp Ser Val Ser Phe Ala His Tyr Cys Glu Lys Glu Leu Asn
145                 150                 155                 160
Leu Pro Ala Val Leu Gly Val Ala Asn Gln Ile Thr Arg Ala Leu Leu
                165                 170                 175
Gly Val Glu Ala His Glu Ile Ser Met Leu Phe Leu Thr Asp Tyr Ile
            180                 185                 190
Lys Ser Ala Thr Gly Leu Ser Asn Ile Phe Ser Asp Lys Lys Asp Gly
        195                 200                 205
Gly Gln Tyr Met Arg Cys Lys Thr Gly Met Gln Ser Ile Cys His Ala
    210                 215                 220
Met Ser Lys Glu Leu Val Pro Gly Ser Val His Leu Asn Thr Pro Val
225                 230                 235                 240
Ala Glu Ile Glu Gln Ser Ala Ser Gly Cys Thr Val Arg Ser Ala Ser
                245                 250                 255
Gly Ala Val Phe Arg Ser Lys Lys Val Val Val Ser Leu Pro Thr Thr
            260                 265                 270
Leu Tyr Pro Thr Leu Thr Phe Ser Pro Pro Leu Pro Ala Glu Lys Gln
        275                 280                 285
Ala Leu Ala Glu Asn Ser Ile Leu Gly Tyr Tyr Ser Lys Ile Val Phe
    290                 295                 300
Val Trp Asp Lys Pro Trp Trp Arg Glu Gln Gly Phe Ser Gly Val Leu
305                 310                 315                 320
Gln Ser Ser Cys Asp Pro Ile Ser Phe Ala Arg Asp Thr Ser Ile Asp
                325                 330                 335
Val Asp Arg Gln Trp Ser Ile Thr Cys Phe Met Val Gly Asp Pro Gly
            340                 345                 350
Arg Lys Trp Ser Gln Gln Ser Lys Gln Val Arg Gln Lys Ser Val Trp
        355                 360                 365
Asp Gln Leu Arg Ala Ala Tyr Glu Asn Ala Gly Ala Gln Val Pro Glu
    370                 375                 380
Pro Ala Asn Val Leu Glu Ile Glu Trp Ser Lys Gln Gln Tyr Phe Gln
385                 390                 395                 400
Gly Ala Pro Ser Ala Val Tyr Gly Leu Asn Asp Leu Ile Thr Leu Gly
                405                 410                 415
Ser Ala Leu Arg Thr Pro Phe Lys Ser Val His Phe Val Gly Thr Glu
            420                 425                 430
Thr Ser Leu Val Trp Lys Gly Tyr Met Glu Gly Ala Ile Arg Ser Gly
        435                 440                 445
Gln Arg Gly Ala Ala Glu Val Val Ala Ser Leu Val Pro Ala Ala
    450                 455                 460
```

<210> 12
<211> 34
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer sequence designed for cloning DNA into expression vectors, N23256

<400> 12
ggggaattca aagacaacgt tgcggacgtg gtag 34

<210> 13
<211> 34
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer sequence designed for cloning DNA into expression vectors, N23259

<400> 13
ggggcggccg cctatgctgc tggcaccagg ctag 34

<210> 14
<211> 29
<212> DNA
<213> Artificial Sequence

<220>
<223> Designed oligonucleotide for 3' RACE, N21965

<400> 14
tggtttcgtt accgacaacc ttgtatccc 29

<210> 15
<211> 28
<212> DNA
<213> Artificial Sequence

<220>
<223> Designed oligonucleotide for 5' race, N21968

<400> 15
gagttggtcc cagacagact tttgtcgt 28

<210> 16
<211> 1673
<212> DNA
<213> Exophiala spinifera

<220>
<221> sig_peptide
<222> (1)...(267)
<223> yeast alpha mating factor secretion signal.

<221> CDS
<222> (1)...(1662)

<400> 16
atg aga ttt cct tca att ttt act gct gtt tta ttc gca gca tcc tcc 48
Met Arg Phe Pro Ser Ile Phe Thr Ala Val Leu Phe Ala Ala Ser Ser
-85 -80 -75

gca tta gct gct cca gtc aac act aca aca gaa gat gaa acg gca caa 96
Ala Leu Ala Ala Pro Val Asn Thr Thr Thr Glu Asp Glu Thr Ala Gln
-70 -65 -60

```
att ccg gct gaa gct gtc atc ggt tac tca gat tta gaa ggg gat ttc      144
Ile Pro Ala Glu Ala Val Ile Gly Tyr Ser Asp Leu Glu Gly Asp Phe
        -55                 -50                 -45

gat gtt gct gtt ttg cca ttt tcc aac agc aca aat aac ggg tta ttg      192
Asp Val Ala Val Leu Pro Phe Ser Asn Ser Thr Asn Asn Gly Leu Leu
    -40                 -35                 -30

ttt ata aat act act att gcc agc att gct gct aaa gaa gaa ggg gta      240
Phe Ile Asn Thr Thr Ile Ala Ser Ile Ala Ala Lys Glu Glu Gly Val
-25                 -20                 -15                 -10

tct ctc gag aaa aga gag gct gaa gct gaa ttc aaa gac aac gtt gcg      288
Ser Leu Glu Lys Arg Glu Ala Glu Ala Glu Phe Lys Asp Asn Val Ala
                -5                  1                   5

gac gtg gta gtg gtg ggc gct ggc ttg agc ggt ttg gag acg gca cgc      336
Asp Val Val Val Val Gly Ala Gly Leu Ser Gly Leu Glu Thr Ala Arg
         10                  15                  20

aaa gtc cag gcc gcc ggt ctg tcc tgc ctc gtt ctt gag gcg atg gat      384
Lys Val Gln Ala Ala Gly Leu Ser Cys Leu Val Leu Glu Ala Met Asp
     25                  30                  35

cgt gta ggg gga aag act ctg agc gta caa tcg ggt ccc ggc agg acg      432
Arg Val Gly Gly Lys Thr Leu Ser Val Gln Ser Gly Pro Gly Arg Thr
 40                  45                  50                  55

act atc aac gac ctc ggc gct gcg tgg atc aat gac agc aac caa agc      480
Thr Ile Asn Asp Leu Gly Ala Ala Trp Ile Asn Asp Ser Asn Gln Ser
                60                  65                  70

gaa gta tcc aga ttg ttt gaa aga ttt cat ttg gag ggc gag ctc cag      528
Glu Val Ser Arg Leu Phe Glu Arg Phe His Leu Glu Gly Glu Leu Gln
            75                  80                  85

agg acg act gga aat tca atc cat caa gca caa gac ggt aca acc act      576
Arg Thr Thr Gly Asn Ser Ile His Gln Ala Gln Asp Gly Thr Thr Thr
         90                  95                  100

aca gct cct tat ggt gac tcc ttg ctg agc gag gag gtt gca agt gca      624
Thr Ala Pro Tyr Gly Asp Ser Leu Leu Ser Glu Glu Val Ala Ser Ala
    105                 110                 115

ctt gcg gaa ctc ctc ccc gta tgg tct cag ctg atc gaa gag cat agc      672
Leu Ala Glu Leu Leu Pro Val Trp Ser Gln Leu Ile Glu Glu His Ser
120                 125                 130                 135

ctt caa gac ctc aag gcg agc cct cag gcg aag cgg ctc gac agt gtg      720
Leu Gln Asp Leu Lys Ala Ser Pro Gln Ala Lys Arg Leu Asp Ser Val
                140                 145                 150

agc ttc gcg cac tac tgt gag aag gaa cta aac ttg cct gct gtt ctc      768
Ser Phe Ala His Tyr Cys Glu Lys Glu Leu Asn Leu Pro Ala Val Leu
            155                 160                 165

ggc gta gca aac cag atc aca cgc gct ctg ctc ggt gtg gaa gcc cac      816
Gly Val Ala Asn Gln Ile Thr Arg Ala Leu Leu Gly Val Glu Ala His
        170                 175                 180

gag atc agc atg ctt ttt ctc acc gac tac atc aag agt gcc acc ggt      864
```

```
Glu Ile Ser Met Leu Phe Leu Thr Asp Tyr Ile Lys Ser Ala Thr Gly
    185                 190                 195

ctc agt aat att ttc tcg gac aag aaa gac ggc ggg cag tat atg cga      912
Leu Ser Asn Ile Phe Ser Asp Lys Lys Asp Gly Gly Gln Tyr Met Arg
200                 205                 210                 215

tgc aaa aca ggt atg cag tcg att tgc cat gcc atg tca aag gaa ctt      960
Cys Lys Thr Gly Met Gln Ser Ile Cys His Ala Met Ser Lys Glu Leu
                220                 225                 230

gtt cca ggc tca gtg cac ctc aac acc ccc gtc gct gaa att gag cag     1008
Val Pro Gly Ser Val His Leu Asn Thr Pro Val Ala Glu Ile Glu Gln
            235                 240                 245

tcg gca tcc ggc tgt aca gta cga tcg gcc tcg ggc gcc gtg ttc cga     1056
Ser Ala Ser Gly Cys Thr Val Arg Ser Ala Ser Gly Ala Val Phe Arg
        250                 255                 260

agc aaa aag gtg gtg gtt tcg tta ccg aca acc ttg tat ccc acc ttg     1104
Ser Lys Lys Val Val Val Ser Leu Pro Thr Thr Leu Tyr Pro Thr Leu
    265                 270                 275

aca ttt tca cca cct ctt ccc gcc gag aag caa gca ttg gcg gaa aat     1152
Thr Phe Ser Pro Pro Leu Pro Ala Glu Lys Gln Ala Leu Ala Glu Asn
280                 285                 290                 295

tct atc ctg ggc tac tat agc aag ata gtc ttc gta tgg gac aag ccg     1200
Ser Ile Leu Gly Tyr Tyr Ser Lys Ile Val Phe Val Trp Asp Lys Pro
                300                 305                 310

tgg tgg cgc gaa caa ggc ttc tcg ggc gtc ctc caa tcg agc tgt gac     1248
Trp Trp Arg Glu Gln Gly Phe Ser Gly Val Leu Gln Ser Ser Cys Asp
            315                 320                 325

ccc atc tca ttt gcc aga gat acc agc atc gac gtc gat cga caa tgg     1296
Pro Ile Ser Phe Ala Arg Asp Thr Ser Ile Asp Val Asp Arg Gln Trp
        330                 335                 340

tcc att acc tgt ttc atg gtc gga gac ccg gga cgg aag tgg tcc caa     1344
Ser Ile Thr Cys Phe Met Val Gly Asp Pro Gly Arg Lys Trp Ser Gln
    345                 350                 355

cag tcc aag cag gta cga caa aag tct gtc tgg gac caa ctc cgc gca     1392
Gln Ser Lys Gln Val Arg Gln Lys Ser Val Trp Asp Gln Leu Arg Ala
360                 365                 370                 375

gcc tac gag aac gcc ggg gcc caa gtc cca gag ccg gcc aac gtg ctc     1440
Ala Tyr Glu Asn Ala Gly Ala Gln Val Pro Glu Pro Ala Asn Val Leu
                380                 385                 390

gaa atc gag tgg tcg aag cag cag tat ttc caa gga gct ccg agc gcc     1488
Glu Ile Glu Trp Ser Lys Gln Gln Tyr Phe Gln Gly Ala Pro Ser Ala
            395                 400                 405

gtc tat ggg ctg aac gat ctc atc aca ctg ggt tcg gcg ctc aga acg     1536
Val Tyr Gly Leu Asn Asp Leu Ile Thr Leu Gly Ser Ala Leu Arg Thr
        410                 415                 420

ccg ttc aag agt gtt cat ttc gtt gga acg gag acg tct tta gtt tgg     1584
Pro Phe Lys Ser Val His Phe Val Gly Thr Glu Thr Ser Leu Val Trp
    425                 430                 435
```

```
aaa ggg tat atg gaa ggg gcc ata cga tcg ggt caa cga ggt gct gca      1632
Lys Gly Tyr Met Glu Gly Ala Ile Arg Ser Gly Gln Arg Gly Ala Ala
440                 445                 450                 455

gaa gtt gtg gct agc ctg gtg cca gca gca taggcggccg c                1673
Glu Val Val Ala Ser Leu Val Pro Ala Ala
                460                 465
```

<210> 17
<211> 554
<212> PRT
<213> Exophiala spinifera

<220>
<221> SIGNAL
<222> (1)...(89)
<223> yeast alpha mating factor secretion signal.

<400> 17

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Met Arg Phe Pro Ser Ile Phe Thr Ala Val Leu Phe Ala Ala Ser Ser
                -85                 -80                 -75
Ala Leu Ala Ala Pro Val Asn Thr Thr Thr Glu Asp Glu Thr Ala Gln
            -70                 -65                 -60
Ile Pro Ala Glu Ala Val Ile Gly Tyr Ser Asp Leu Glu Gly Asp Phe
        -55                 -50                 -45
Asp Val Ala Val Leu Pro Phe Ser Asn Ser Thr Asn Asn Gly Leu Leu
    -40                 -35                 -30
Phe Ile Asn Thr Thr Ile Ala Ser Ile Ala Ala Lys Glu Glu Gly Val
-25                 -20                 -15                 -10
Ser Leu Glu Lys Arg Glu Ala Glu Ala Glu Phe Lys Asp Asn Val Ala
                -5                  1                   5
Asp Val Val Val Val Gly Ala Gly Leu Ser Gly Leu Glu Thr Ala Arg
        10                  15                  20
Lys Val Gln Ala Ala Gly Leu Ser Cys Leu Val Leu Glu Ala Met Asp
    25                  30                  35
Arg Val Gly Gly Lys Thr Leu Ser Val Gln Ser Gly Pro Gly Arg Thr
40                  45                  50                  55
Thr Ile Asn Asp Leu Gly Ala Ala Trp Ile Asn Asp Ser Asn Gln Ser
                60                  65                  70
Glu Val Ser Arg Leu Phe Glu Arg Phe His Leu Glu Gly Glu Leu Gln
            75                  80                  85
Arg Thr Thr Gly Asn Ser Ile His Gln Ala Gln Asp Gly Thr Thr Thr
        90                  95                  100
Thr Ala Pro Tyr Gly Asp Ser Leu Leu Ser Glu Glu Val Ala Ser Ala
    105                 110                 115
Leu Ala Glu Leu Leu Pro Val Trp Ser Gln Leu Ile Glu Glu His Ser
120                 125                 130                 135
Leu Gln Asp Leu Lys Ala Ser Pro Gln Ala Lys Arg Leu Asp Ser Val
                140                 145                 150
Ser Phe Ala His Tyr Cys Glu Lys Glu Leu Asn Leu Pro Ala Val Leu
            155                 160                 165
Gly Val Ala Asn Gln Ile Thr Arg Ala Leu Leu Gly Val Glu Ala His
        170                 175                 180
Glu Ile Ser Met Leu Phe Leu Thr Asp Tyr Ile Lys Ser Ala Thr Gly
    185                 190                 195
Leu Ser Asn Ile Phe Ser Asp Lys Lys Asp Gly Gly Gln Tyr Met Arg
200                 205                 210                 215
Cys Lys Thr Gly Met Gln Ser Ile Cys His Ala Met Ser Lys Glu Leu
                220                 225                 230
Val Pro Gly Ser Val His Leu Asn Thr Pro Val Ala Glu Ile Glu Gln
```

```
            235                 240                 245
Ser Ala Ser Gly Cys Thr Val Arg Ser Ala Ser Gly Ala Val Phe Arg
        250                 255                 260
Ser Lys Lys Val Val Val Ser Leu Pro Thr Thr Leu Tyr Pro Thr Leu
    265                 270                 275
Thr Phe Ser Pro Pro Leu Pro Ala Glu Lys Gln Ala Leu Ala Glu Asn
280                 285                 290                 295
Ser Ile Leu Gly Tyr Tyr Ser Lys Ile Val Phe Val Trp Asp Lys Pro
                300                 305                 310
Trp Trp Arg Glu Gln Gly Phe Ser Gly Val Leu Gln Ser Ser Cys Asp
            315                 320                 325
Pro Ile Ser Phe Ala Arg Asp Thr Ser Ile Asp Val Asp Arg Gln Trp
        330                 335                 340
Ser Ile Thr Cys Phe Met Val Gly Asp Pro Gly Arg Lys Trp Ser Gln
    345                 350                 355
Gln Ser Lys Gln Val Arg Gln Lys Ser Val Trp Asp Gln Leu Arg Ala
360                 365                 370                 375
Ala Tyr Glu Asn Ala Gly Ala Gln Val Pro Glu Pro Ala Asn Val Leu
                380                 385                 390
Glu Ile Glu Trp Ser Lys Gln Gln Tyr Phe Gln Gly Ala Pro Ser Ala
            395                 400                 405
Val Tyr Gly Leu Asn Asp Leu Ile Thr Leu Gly Ser Ala Leu Arg Thr
        410                 415                 420
Pro Phe Lys Ser Val His Phe Val Gly Thr Glu Thr Ser Leu Val Trp
    425                 430                 435
Lys Gly Tyr Met Glu Gly Ala Ile Arg Ser Gly Gln Arg Gly Ala Ala
440                 445                 450                 455
Glu Val Val Ala Ser Leu Val Pro Ala Ala
                460                 465
```

<210> 18
<211> 2079
<212> DNA
<213> Unknown

<220>
<221> CDS
<222> (1)...(2076)

<223> GST:K:trAPAO 2079 nt. Translation starting at nt 1 - 687, gst fusion + polylinker; 688-2076, K:trAPAO; 2077-2079, stop codon. For bacterial expression.

<221> misc_feature
<222> (1)...(687)
<223> gst fusion + polylinker

<221> misc_feature
<222> (688)...(2076)
<223> K:trAPAO

<221> misc_feature
<222> (688)...(690)
<223> Extra lysine

<400> 18

```
atg tcc cct ata cta ggt tat tgg aaa att aag ggc ctt gtg caa ccc        48
Met Ser Pro Ile Leu Gly Tyr Trp Lys Ile Lys Gly Leu Val Gln Pro
 1               5                  10                  15

act cga ctt ctt ttg gaa tat ctt gaa gaa aaa tat gaa gag cat ttg        96
```

```
Thr Arg Leu Leu Leu Glu Tyr Leu Glu Glu Lys Tyr Glu Glu His Leu
             20                  25                  30

tat gag cgc gat gaa ggt gat aaa tgg cga aac aaa aag ttt gaa ttg      144
Tyr Glu Arg Asp Glu Gly Asp Lys Trp Arg Asn Lys Lys Phe Glu Leu
         35                  40                  45

ggt ttg gag ttt ccc aat ctt cct tat tat att gat ggt gat gtt aaa      192
Gly Leu Glu Phe Pro Asn Leu Pro Tyr Tyr Ile Asp Gly Asp Val Lys
     50                  55                  60

tta aca cag tct atg gcc atc ata cgt tat ata gct gac aag cac aac      240
Leu Thr Gln Ser Met Ala Ile Ile Arg Tyr Ile Ala Asp Lys His Asn
 65                  70                  75                  80

atg ttg ggt ggt tgt cca aaa gag cgt gca gag att tca atg ctt gaa      288
Met Leu Gly Gly Cys Pro Lys Glu Arg Ala Glu Ile Ser Met Leu Glu
                 85                  90                  95

gga gcg gtt ttg gat att aga tac ggt gtt tcg aga att gca tat agt      336
Gly Ala Val Leu Asp Ile Arg Tyr Gly Val Ser Arg Ile Ala Tyr Ser
            100                 105                 110

aaa gac ttt gaa act ctc aaa gtt gat ttt ctt agc aag cta cct gaa      384
Lys Asp Phe Glu Thr Leu Lys Val Asp Phe Leu Ser Lys Leu Pro Glu
        115                 120                 125

atg ctg aaa atg ttc gaa gat cgt tta tgt cat aaa aca tat tta aat      432
Met Leu Lys Met Phe Glu Asp Arg Leu Cys His Lys Thr Tyr Leu Asn
    130                 135                 140

ggt gat cat gta acc cat cct gac ttc atg ttg tat gac gct ctt gat      480
Gly Asp His Val Thr His Pro Asp Phe Met Leu Tyr Asp Ala Leu Asp
145                 150                 155                 160

gtt gtt tta tac atg gac cca atg tgc ctg gat gcg ttc cca aaa tta      528
Val Val Leu Tyr Met Asp Pro Met Cys Leu Asp Ala Phe Pro Lys Leu
                165                 170                 175

gtt tgt ttt aaa aaa cgt att gaa gct atc cca caa att gat aag tac      576
Val Cys Phe Lys Lys Arg Ile Glu Ala Ile Pro Gln Ile Asp Lys Tyr
            180                 185                 190

ttg aaa tcc agc aag tat ata gca tgg cct ttg cag ggc tgg caa gcc      624
Leu Lys Ser Ser Lys Tyr Ile Ala Trp Pro Leu Gln Gly Trp Gln Ala
        195                 200                 205

acg ttt ggt ggt ggc gac cat cct cca aaa tcg gat ctg gtt ccg cgt      672
Thr Phe Gly Gly Gly Asp His Pro Pro Lys Ser Asp Leu Val Pro Arg
    210                 215                 220

gga tcc ccg gaa ttc aaa gac aac gtt gcg gac gtg gta gtg gtg ggc      720
Gly Ser Pro Glu Phe Lys Asp Asn Val Ala Asp Val Val Val Val Gly
225                 230                 235                 240

gct ggc ttg agc ggt ttg gag acg gca cgc aaa gtc cag gcc gcc ggt      768
Ala Gly Leu Ser Gly Leu Glu Thr Ala Arg Lys Val Gln Ala Ala Gly
                245                 250                 255

ctg tcc tgc ctc gtt ctt gag gcg atg gat cgt gta ggg gga aag act      816
Leu Ser Cys Leu Val Leu Glu Ala Met Asp Arg Val Gly Gly Lys Thr
            260                 265                 270
```

```
ctg agc gta caa tcg ggt ccc ggc agg acg act atc aac gac ctc ggc      864
Leu Ser Val Gln Ser Gly Pro Gly Arg Thr Thr Ile Asn Asp Leu Gly
        275                 280                 285

gct gcg tgg atc aat gac agc aac caa agc gaa gta tcc aga ttg ttt      912
Ala Ala Trp Ile Asn Asp Ser Asn Gln Ser Glu Val Ser Arg Leu Phe
    290                 295                 300

gaa aga ttt cat ttg gag ggc gag ctc cag agg acg act gga aat tca      960
Glu Arg Phe His Leu Glu Gly Glu Leu Gln Arg Thr Thr Gly Asn Ser
305                 310                 315                 320

atc cat caa gca caa gac ggt aca acc act aca gct cct tat ggt gac     1008
Ile His Gln Ala Gln Asp Gly Thr Thr Thr Thr Ala Pro Tyr Gly Asp
                325                 330                 335

tcc ttg ctg agc gag gag gtt gca agt gca ctt gcg gaa ctc ctc ccc     1056
Ser Leu Leu Ser Glu Glu Val Ala Ser Ala Leu Ala Glu Leu Leu Pro
            340                 345                 350

gta tgg tct cag ctg atc gaa gag cat agc ctt caa gac ctc aag gcg     1104
Val Trp Ser Gln Leu Ile Glu Glu His Ser Leu Gln Asp Leu Lys Ala
        355                 360                 365

agc cct cag gcg aag cgg ctc gac agt gtg agc ttc gcg cac tac tgt     1152
Ser Pro Gln Ala Lys Arg Leu Asp Ser Val Ser Phe Ala His Tyr Cys
    370                 375                 380

gag aag gaa cta aac ttg cct gct gtt ctc ggc gta gca aac cag atc     1200
Glu Lys Glu Leu Asn Leu Pro Ala Val Leu Gly Val Ala Asn Gln Ile
385                 390                 395                 400

aca cgc gct ctg ctc ggt gtg gaa gcc cac gag atc agc atg ctt ttt     1248
Thr Arg Ala Leu Leu Gly Val Glu Ala His Glu Ile Ser Met Leu Phe
                405                 410                 415

ctc acc gac tac atc aag agt gcc acc ggt ctc agt aat att ttc tcg     1296
Leu Thr Asp Tyr Ile Lys Ser Ala Thr Gly Leu Ser Asn Ile Phe Ser
            420                 425                 430

gac aag aaa gac ggc ggg cag tat atg cga tgc aaa aca ggt atg cag     1344
Asp Lys Lys Asp Gly Gly Gln Tyr Met Arg Cys Lys Thr Gly Met Gln
        435                 440                 445

tcg att tgc cat gcc atg tca aag gaa ctt gtt cca ggc tca gtg cac     1392
Ser Ile Cys His Ala Met Ser Lys Glu Leu Val Pro Gly Ser Val His
    450                 455                 460

ctc aac acc ccc gtc gct gaa att gag cag tcg gca tcc ggc tgt aca     1440
Leu Asn Thr Pro Val Ala Glu Ile Glu Gln Ser Ala Ser Gly Cys Thr
465                 470                 475                 480

gta cga tcg gcc tcg ggc gcc gtg ttc cga agc aaa aag gtg gtg gtt     1488
Val Arg Ser Ala Ser Gly Ala Val Phe Arg Ser Lys Lys Val Val Val
                485                 490                 495

tcg tta ccg aca acc ttg tat ccc acc ttg aca ttt tca cca cct ctt     1536
Ser Leu Pro Thr Thr Leu Tyr Pro Thr Leu Thr Phe Ser Pro Pro Leu
            500                 505                 510

ccc gcc gag aag caa gca ttg gcg gaa aat tct atc ctg ggc tac tat     1584
```

```
Pro Ala Glu Lys Gln Ala Leu Ala Glu Asn Ser Ile Leu Gly Tyr Tyr
        515                 520                 525

agc aag ata gtc ttc gta tgg gac aag ccg tgg tgg cgc gaa caa ggc      1632
Ser Lys Ile Val Phe Val Trp Asp Lys Pro Trp Trp Arg Glu Gln Gly
    530                 535                 540

ttc tcg ggc gtc ctc caa tcg agc tgt gac ccc atc tca ttt gcc aga      1680
Phe Ser Gly Val Leu Gln Ser Ser Cys Asp Pro Ile Ser Phe Ala Arg
545                 550                 555                 560

gat acc agc atc gac gtc gat cga caa tgg tcc att acc tgt ttc atg      1728
Asp Thr Ser Ile Asp Val Asp Arg Gln Trp Ser Ile Thr Cys Phe Met
                565                 570                 575

gtc gga gac ccg gga cgg aag tgg tcc caa cag tcc aag cag gta cga      1776
Val Gly Asp Pro Gly Arg Lys Trp Ser Gln Gln Ser Lys Gln Val Arg
            580                 585                 590

caa aag tct gtc tgg gac caa ctc cgc gca gcc tac gag aac gcc ggg      1824
Gln Lys Ser Val Trp Asp Gln Leu Arg Ala Ala Tyr Glu Asn Ala Gly
        595                 600                 605

gcc caa gtc cca gag ccg gcc aac gtg ctc gaa atc gag tgg tcg aag      1872
Ala Gln Val Pro Glu Pro Ala Asn Val Leu Glu Ile Glu Trp Ser Lys
    610                 615                 620

cag cag tat ttc caa gga gct ccg agc gcc gtc tat ggg ctg aac gat      1920
Gln Gln Tyr Phe Gln Gly Ala Pro Ser Ala Val Tyr Gly Leu Asn Asp
625                 630                 635                 640

ctc atc aca ctg ggt tcg gcg ctc aga acg ccg ttc aag agt gtt cat      1968
Leu Ile Thr Leu Gly Ser Ala Leu Arg Thr Pro Phe Lys Ser Val His
                645                 650                 655

ttc gtt gga acg gag acg tct tta gtt tgg aaa ggg tat atg gaa ggg      2016
Phe Val Gly Thr Glu Thr Ser Leu Val Trp Lys Gly Tyr Met Glu Gly
            660                 665                 670

gcc ata cga tcg ggt caa cga ggt gct gca gaa gtt gtg gct agc ctg      2064
Ala Ile Arg Ser Gly Gln Arg Gly Ala Ala Glu Val Val Ala Ser Leu
        675                 680                 685

gtg cca gca gca tag                                                 2079
Val Pro Ala Ala
    690
```

<210> 19
<211> 692
<212> PRT
<213> Unknown

<220>
<223> GST:K:trAPAO; GST + linker, aa 1-229; K:trAPAO, aa 230-692

<400> 19

```
Met Ser Pro Ile Leu Gly Tyr Trp Lys Ile Lys Gly Leu Val Gln Pro
 1               5                  10                  15
Thr Arg Leu Leu Leu Glu Tyr Leu Glu Glu Lys Tyr Glu Glu His Leu
            20                  25                  30
```

```
Tyr Glu Arg Asp Glu Gly Asp Lys Trp Arg Asn Lys Lys Phe Glu Leu
        35                  40                  45
Gly Leu Glu Phe Pro Asn Leu Pro Tyr Tyr Ile Asp Gly Asp Val Lys
    50                  55                  60
Leu Thr Gln Ser Met Ala Ile Ile Arg Tyr Ile Ala Asp Lys His Asn
65                  70                  75                  80
Met Leu Gly Gly Cys Pro Lys Glu Arg Ala Glu Ile Ser Met Leu Glu
                85                  90                  95
Gly Ala Val Leu Asp Ile Arg Tyr Gly Val Ser Arg Ile Ala Tyr Ser
            100                 105                 110
Lys Asp Phe Glu Thr Leu Lys Val Asp Phe Leu Ser Lys Leu Pro Glu
        115                 120                 125
Met Leu Lys Met Phe Glu Asp Arg Leu Cys His Lys Thr Tyr Leu Asn
    130                 135                 140
Gly Asp His Val Thr His Pro Asp Phe Met Leu Tyr Asp Ala Leu Asp
145                 150                 155                 160
Val Val Leu Tyr Met Asp Pro Met Cys Leu Asp Ala Phe Pro Lys Leu
                165                 170                 175
Val Cys Phe Lys Lys Arg Ile Glu Ala Ile Pro Gln Ile Asp Lys Tyr
            180                 185                 190
Leu Lys Ser Ser Lys Tyr Ile Ala Trp Pro Leu Gln Gly Trp Gln Ala
        195                 200                 205
Thr Phe Gly Gly Gly Asp His Pro Pro Lys Ser Asp Leu Val Pro Arg
    210                 215                 220
Gly Ser Pro Glu Phe Lys Asp Asn Val Ala Asp Val Val Val Val Gly
225                 230                 235                 240
Ala Gly Leu Ser Gly Leu Glu Thr Ala Arg Lys Val Gln Ala Ala Gly
                245                 250                 255
Leu Ser Cys Leu Val Leu Glu Ala Met Asp Arg Val Gly Gly Lys Thr
            260                 265                 270
Leu Ser Val Gln Ser Gly Pro Gly Arg Thr Thr Ile Asn Asp Leu Gly
        275                 280                 285
Ala Ala Trp Ile Asn Asp Ser Asn Gln Ser Glu Val Ser Arg Leu Phe
    290                 295                 300
Glu Arg Phe His Leu Glu Gly Glu Leu Gln Arg Thr Thr Gly Asn Ser
305                 310                 315                 320
Ile His Gln Ala Gln Asp Gly Thr Thr Thr Thr Ala Pro Tyr Gly Asp
                325                 330                 335
Ser Leu Leu Ser Glu Glu Val Ala Ser Ala Leu Ala Glu Leu Leu Pro
            340                 345                 350
Val Trp Ser Gln Leu Ile Glu Glu His Ser Leu Gln Asp Leu Lys Ala
        355                 360                 365
Ser Pro Gln Ala Lys Arg Leu Asp Ser Val Ser Phe Ala His Tyr Cys
    370                 375                 380
Glu Lys Glu Leu Asn Leu Pro Ala Val Leu Gly Val Ala Asn Gln Ile
385                 390                 395                 400
Thr Arg Ala Leu Leu Gly Val Glu Ala His Glu Ile Ser Met Leu Phe
                405                 410                 415
Leu Thr Asp Tyr Ile Lys Ser Ala Thr Gly Leu Ser Asn Ile Phe Ser
            420                 425                 430
Asp Lys Lys Asp Gly Gly Gln Tyr Met Arg Cys Lys Thr Gly Met Gln
        435                 440                 445
Ser Ile Cys His Ala Met Ser Lys Glu Leu Val Pro Gly Ser Val His
    450                 455                 460
Leu Asn Thr Pro Val Ala Glu Ile Glu Gln Ser Ala Ser Gly Cys Thr
465                 470                 475                 480
Val Arg Ser Ala Ser Gly Ala Val Phe Arg Ser Lys Lys Val Val Val
                485                 490                 495
Ser Leu Pro Thr Thr Leu Tyr Pro Thr Leu Thr Phe Ser Pro Pro Leu
            500                 505                 510
Pro Ala Glu Lys Gln Ala Leu Ala Glu Asn Ser Ile Leu Gly Tyr Tyr
        515                 520                 525
```

```
Ser Lys Ile Val Phe Val Trp Asp Lys Pro Trp Trp Arg Glu Gln Gly
    530                 535                 540
Phe Ser Gly Val Leu Gln Ser Ser Cys Asp Pro Ile Ser Phe Ala Arg
545                 550                 555                 560
Asp Thr Ser Ile Asp Val Asp Arg Gln Trp Ser Ile Thr Cys Phe Met
                565                 570                 575
Val Gly Asp Pro Gly Arg Lys Trp Ser Gln Gln Ser Lys Gln Val Arg
            580                 585                 590
Gln Lys Ser Val Trp Asp Gln Leu Arg Ala Ala Tyr Glu Asn Ala Gly
        595                 600                 605
Ala Gln Val Pro Glu Pro Ala Asn Val Leu Glu Ile Glu Trp Ser Lys
    610                 615                 620
Gln Gln Tyr Phe Gln Gly Ala Pro Ser Ala Val Tyr Gly Leu Asn Asp
625                 630                 635                 640
Leu Ile Thr Leu Gly Ser Ala Leu Arg Thr Pro Phe Lys Ser Val His
                645                 650                 655
Phe Val Gly Thr Glu Thr Ser Leu Val Trp Lys Gly Tyr Met Glu Gly
            660                 665                 670
Ala Ile Arg Ser Gly Gln Arg Gly Ala Ala Glu Val Val Ala Ser Leu
        675                 680                 685
Val Pro Ala Ala
    690
```

<210> 20
<211> 1464
<212> DNA
<213> Unknown

<220>
<221> sig_peptide
<222> (1)...(72)
<223> Barley Alpha Amylase signal sequence.

<221> misc_feature
<222> (73)...(1464)
<223> K:trAPAOcDNA

<221> CDS
<222> (1)...(1461)

<223> Nucleotide sequence of K:trAPAO translational fusion with barley alpha amylase signal sequence, for expression and secretion of the mature trAPAO in maize. Nucleotides 1-72, barley alpha amylase signal sequence, nucleotides 73-75, added lysine residue; nucleotides 76 -1464 , trAPAO cDNA.

<221> misc_feature
<222> (73)...(75)
<223> Added lysine residue

<400> 20

```
atg gcc aac aag cac ctg agc ctc tcc ctc ttc ctc gtg ctc ctc ggc       48
Met Ala Asn Lys His Leu Ser Leu Ser Leu Phe Leu Val Leu Leu Gly
                -20                 -15                 -10

ctc tcc gcc tcc ctc gcc agc ggc aaa gac aac gtt gcg gac gtg gta       96
Leu Ser Ala Ser Leu Ala Ser Gly Lys Asp Asn Val Ala Asp Val Val
            -5                  1                   5

gtg gtg ggc gct ggc ttg agc ggt ttg gag acg gca cgc aaa gtc cag      144
Val Val Gly Ala Gly Leu Ser Gly Leu Glu Thr Ala Arg Lys Val Gln
```

```
     10                  15                  20

gcc gcc ggt ctg tcc tgc ctc gtt ctt gag gcg atg gat cgt gta ggg      192
Ala Ala Gly Leu Ser Cys Leu Val Leu Glu Ala Met Asp Arg Val Gly
 25                  30                  35                  40

gga aag act ctg agc gta caa tcg ggt ccc ggc agg acg act atc aac      240
Gly Lys Thr Leu Ser Val Gln Ser Gly Pro Gly Arg Thr Thr Ile Asn
                 45                  50                  55

gac ctc ggc gct gcg tgg atc aat gac agc aac caa agc gaa gta tcc      288
Asp Leu Gly Ala Ala Trp Ile Asn Asp Ser Asn Gln Ser Glu Val Ser
             60                  65                  70

aga ttg ttt gaa aga ttt cat ttg gag ggc gag ctc cag agg acg act      336
Arg Leu Phe Glu Arg Phe His Leu Glu Gly Glu Leu Gln Arg Thr Thr
         75                  80                  85

gga aat tca atc cat caa gca caa gac ggt aca acc act aca gct cct      384
Gly Asn Ser Ile His Gln Ala Gln Asp Gly Thr Thr Thr Thr Ala Pro
     90                  95                  100

tat ggt gac tcc ttg ctg agc gag gag gtt gca agt gca ctt gcg gaa      432
Tyr Gly Asp Ser Leu Leu Ser Glu Glu Val Ala Ser Ala Leu Ala Glu
105                 110                 115                 120

ctc ctc ccc gta tgg tct cag ctg atc gaa gag cat agc ctt caa gac      480
Leu Leu Pro Val Trp Ser Gln Leu Ile Glu Glu His Ser Leu Gln Asp
                125                 130                 135

ctc aag gcg agc cct cag gcg aag cgg ctc gac agt gtg agc ttc gcg      528
Leu Lys Ala Ser Pro Gln Ala Lys Arg Leu Asp Ser Val Ser Phe Ala
            140                 145                 150

cac tac tgt gag aag gaa cta aac ttg cct gct gtt ctc ggc gta gca      576
His Tyr Cys Glu Lys Glu Leu Asn Leu Pro Ala Val Leu Gly Val Ala
        155                 160                 165

aac cag atc aca cgc gct ctg ctc ggt gtg gaa gcc cac gag atc agc      624
Asn Gln Ile Thr Arg Ala Leu Leu Gly Val Glu Ala His Glu Ile Ser
    170                 175                 180

atg ctt ttt ctc acc gac tac atc aag agt gcc acc ggt ctc agt aat      672
Met Leu Phe Leu Thr Asp Tyr Ile Lys Ser Ala Thr Gly Leu Ser Asn
185                 190                 195                 200

att ttc tcg gac aag aaa gac ggc ggg cag tat atg cga tgc aaa aca      720
Ile Phe Ser Asp Lys Lys Asp Gly Gly Gln Tyr Met Arg Cys Lys Thr
                205                 210                 215

ggt atg cag tcg att tgc cat gcc atg tca aag gaa ctt gtt cca ggc      768
Gly Met Gln Ser Ile Cys His Ala Met Ser Lys Glu Leu Val Pro Gly
            220                 225                 230

tca gtg cac ctc aac acc ccc gtc gct gaa att gag cag tcg gca tcc      816
Ser Val His Leu Asn Thr Pro Val Ala Glu Ile Glu Gln Ser Ala Ser
        235                 240                 245

ggc tgt aca gta cga tcg gcc tcg ggc gcc gtg ttc cga agc aaa aag      864
Gly Cys Thr Val Arg Ser Ala Ser Gly Ala Val Phe Arg Ser Lys Lys
    250                 255                 260
```

```
gtg gtg gtt tcg tta ccg aca acc ttg tat ccc acc ttg aca ttt tca      912
Val Val Val Ser Leu Pro Thr Thr Leu Tyr Pro Thr Leu Thr Phe Ser
265                 270                 275                 280

cca cct ctt ccc gcc gag aag caa gca ttg gcg gaa aat tct atc ctg      960
Pro Pro Leu Pro Ala Glu Lys Gln Ala Leu Ala Glu Asn Ser Ile Leu
                285                 290                 295

ggc tac tat agc aag ata gtc ttc gta tgg gac aag ccg tgg tgg cgc     1008
Gly Tyr Tyr Ser Lys Ile Val Phe Val Trp Asp Lys Pro Trp Trp Arg
            300                 305                 310

gaa caa ggc ttc tcg ggc gtc ctc caa tcg agc tgt gac ccc atc tca     1056
Glu Gln Gly Phe Ser Gly Val Leu Gln Ser Ser Cys Asp Pro Ile Ser
        315                 320                 325

ttt gcc aga gat acc agc atc gac gtc gat cga caa tgg tcc att acc     1104
Phe Ala Arg Asp Thr Ser Ile Asp Val Asp Arg Gln Trp Ser Ile Thr
    330                 335                 340

tgt ttc atg gtc gga gac ccg gga cgg aag tgg tcc caa cag tcc aag     1152
Cys Phe Met Val Gly Asp Pro Gly Arg Lys Trp Ser Gln Gln Ser Lys
345                 350                 355                 360

cag gta cga caa aag tct gtc tgg gac caa ctc cgc gca gcc tac gag     1200
Gln Val Arg Gln Lys Ser Val Trp Asp Gln Leu Arg Ala Ala Tyr Glu
                365                 370                 375

aac gcc ggg gcc caa gtc cca gag ccg gcc aac gtg ctc gaa atc gag     1248
Asn Ala Gly Ala Gln Val Pro Glu Pro Ala Asn Val Leu Glu Ile Glu
            380                 385                 390

tgg tcg aag cag cag tat ttc caa gga gct ccg agc gcc gtc tat ggg     1296
Trp Ser Lys Gln Gln Tyr Phe Gln Gly Ala Pro Ser Ala Val Tyr Gly
        395                 400                 405

ctg aac gat ctc atc aca ctg ggt tcg gcg ctc aga acg ccg ttc aag     1344
Leu Asn Asp Leu Ile Thr Leu Gly Ser Ala Leu Arg Thr Pro Phe Lys
    410                 415                 420

agt gtt cat ttc gtt gga acg gag acg tct tta gtt tgg aaa ggg tat     1392
Ser Val His Phe Val Gly Thr Glu Thr Ser Leu Val Trp Lys Gly Tyr
425                 430                 435                 440

atg gaa ggg gcc ata cga tcg ggt caa cga ggt gct gca gaa gtt gtg     1440
Met Glu Gly Ala Ile Arg Ser Gly Gln Arg Gly Ala Ala Glu Val Val
                445                 450                 455

gct agc ctg gtg cca gca gca tag                                    1464
Ala Ser Leu Val Pro Ala Ala
            460
```

<210> 21
<211> 487
<212> PRT
<213> Unknown

<220>
<221> SIGNAL
<222> (1)...(24)

<223> K:trAPAO translational fusion with barley alpha amylase signal sequence, for expression and secretion of the mature trAPAO in maize.

<400> 21

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Met Ala Asn Lys His Leu Ser Leu Ser Leu Phe Leu Val Leu Leu Gly
                -20                 -15                 -10
Leu Ser Ala Ser Leu Ala Ser Gly Lys Asp Asn Val Ala Asp Val Val
            -5                  1                   5
Val Val Gly Ala Gly Leu Ser Gly Leu Glu Thr Ala Arg Lys Val Gln
    10                  15                  20
Ala Ala Gly Leu Ser Cys Leu Val Leu Glu Ala Met Asp Arg Val Gly
25                  30                  35                  40
Gly Lys Thr Leu Ser Val Gln Ser Gly Pro Gly Arg Thr Thr Ile Asn
                45                  50                  55
Asp Leu Gly Ala Ala Trp Ile Asn Asp Ser Asn Gln Ser Glu Val Ser
            60                  65                  70
Arg Leu Phe Glu Arg Phe His Leu Glu Gly Glu Leu Gln Arg Thr Thr
        75                  80                  85
Gly Asn Ser Ile His Gln Ala Gln Asp Gly Thr Thr Thr Thr Ala Pro
    90                  95                  100
Tyr Gly Asp Ser Leu Leu Ser Glu Glu Val Ala Ser Ala Leu Ala Glu
105                 110                 115                 120
Leu Leu Pro Val Trp Ser Gln Leu Ile Glu Glu His Ser Leu Gln Asp
                125                 130                 135
Leu Lys Ala Ser Pro Gln Ala Lys Arg Leu Asp Ser Val Ser Phe Ala
            140                 145                 150
His Tyr Cys Glu Lys Glu Leu Asn Leu Pro Ala Val Leu Gly Val Ala
        155                 160                 165
Asn Gln Ile Thr Arg Ala Leu Leu Gly Val Glu Ala His Glu Ile Ser
    170                 175                 180
Met Leu Phe Leu Thr Asp Tyr Ile Lys Ser Ala Thr Gly Leu Ser Asn
185                 190                 195                 200
Ile Phe Ser Asp Lys Lys Asp Gly Gly Gln Tyr Met Arg Cys Lys Thr
                205                 210                 215
Gly Met Gln Ser Ile Cys His Ala Met Ser Lys Glu Leu Val Pro Gly
            220                 225                 230
Ser Val His Leu Asn Thr Pro Val Ala Glu Ile Glu Gln Ser Ala Ser
        235                 240                 245
Gly Cys Thr Val Arg Ser Ala Ser Gly Ala Val Phe Arg Ser Lys Lys
    250                 255                 260
Val Val Val Ser Leu Pro Thr Thr Leu Tyr Pro Thr Leu Thr Phe Ser
265                 270                 275                 280
Pro Pro Leu Pro Ala Glu Lys Gln Ala Leu Ala Glu Asn Ser Ile Leu
                285                 290                 295
Gly Tyr Tyr Ser Lys Ile Val Phe Val Trp Asp Lys Pro Trp Trp Arg
            300                 305                 310
Glu Gln Gly Phe Ser Gly Val Leu Gln Ser Ser Cys Asp Pro Ile Ser
        315                 320                 325
Phe Ala Arg Asp Thr Ser Ile Asp Val Asp Arg Gln Trp Ser Ile Thr
    330                 335                 340
Cys Phe Met Val Gly Asp Pro Gly Arg Lys Trp Ser Gln Gln Ser Lys
345                 350                 355                 360
Gln Val Arg Gln Lys Ser Val Trp Asp Gln Leu Arg Ala Ala Tyr Glu
                365                 370                 375
Asn Ala Gly Ala Gln Val Pro Glu Pro Ala Asn Val Leu Glu Ile Glu
            380                 385                 390
Trp Ser Lys Gln Gln Tyr Phe Gln Gly Ala Pro Ser Ala Val Tyr Gly
        395                 400                 405
Leu Asn Asp Leu Ile Thr Leu Gly Ser Ala Leu Arg Thr Pro Phe Lys
    410                 415                 420
Ser Val His Phe Val Gly Thr Glu Thr Ser Leu Val Trp Lys Gly Tyr
```

```
425                 430                 435                 440
Met Glu Gly Ala Ile Arg Ser Gly Gln Arg Gly Ala Ala Glu Val Val
                445                 450                 455
Ala Ser Leu Val Pro Ala Ala
            460
```

<210> 22
<211> 1803
<212> DNA
<213> Exophiala spinifera

<220>
<221> CDS
<222> (1)...(1800)

<400> 22

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atg gca ctt gca ccg agc tac atc aat ccc cca aac gtc gcc tcc cca       48
Met Ala Leu Ala Pro Ser Tyr Ile Asn Pro Pro Asn Val Ala Ser Pro
 1               5                  10                  15

gca ggg tat tct cac gtc ggc gta ggc cca gac gga ggg agg tat gtg       96
Ala Gly Tyr Ser His Val Gly Val Gly Pro Asp Gly Gly Arg Tyr Val
             20                  25                  30

aca ata gct gga cag att gga caa gac gct tcg ggc gtg aca gac cct      144
Thr Ile Ala Gly Gln Ile Gly Gln Asp Ala Ser Gly Val Thr Asp Pro
         35                  40                  45

gcc tac gag aaa cag gtt gcc caa gca ttc gcc aat ctg cga gct tgc      192
Ala Tyr Glu Lys Gln Val Ala Gln Ala Phe Ala Asn Leu Arg Ala Cys
     50                  55                  60

ctt gct gca gtt gga gcc act tca aac gac gtc acc aag ctc aat tac      240
Leu Ala Ala Val Gly Ala Thr Ser Asn Asp Val Thr Lys Leu Asn Tyr
 65                  70                  75                  80

tac atc gtc gac tac gcc ccg agc aaa ctc acc gca att gga gat ggg      288
Tyr Ile Val Asp Tyr Ala Pro Ser Lys Leu Thr Ala Ile Gly Asp Gly
                 85                  90                  95

ctg aag gct acc ttt gcc ctt gac agg ctc cct cct tgc acg ctg gtg      336
Leu Lys Ala Thr Phe Ala Leu Asp Arg Leu Pro Pro Cys Thr Leu Val
            100                 105                 110

cca gtg tcg gcc ttg tct tca cct gaa tac ctc ttt gag gtt gat gcc      384
Pro Val Ser Ala Leu Ser Ser Pro Glu Tyr Leu Phe Glu Val Asp Ala
        115                 120                 125

acg gcg ctg gtg ccg gga cac acg acc cca gac aac gtt gcg gac gtg      432
Thr Ala Leu Val Pro Gly His Thr Thr Pro Asp Asn Val Ala Asp Val
    130                 135                 140

gta gtg gtg ggc gct ggc ttg agc ggt ttg gag acg gca cgc aaa gtc      480
Val Val Val Gly Ala Gly Leu Ser Gly Leu Glu Thr Ala Arg Lys Val
145                 150                 155                 160

cag gcc gcc ggt ctg tcc tgc ctc gtt ctt gag gcg atg gat cgt gta      528
Gln Ala Ala Gly Leu Ser Cys Leu Val Leu Glu Ala Met Asp Arg Val
                165                 170                 175

ggg gga aag act ctg agc gta caa tcg ggt ccc ggc agg acg act atc      576
Gly Gly Lys Thr Leu Ser Val Gln Ser Gly Pro Gly Arg Thr Thr Ile
```

```
                180                 185                 190

aac gac ctc ggc gct gcg tgg atc aat gac agc aac caa agc gaa gta      624
Asn Asp Leu Gly Ala Ala Trp Ile Asn Asp Ser Asn Gln Ser Glu Val
        195                 200                 205

tcc aga ttg ttt gaa aga ttt cat ttg gag ggc gag ctc cag agg acg      672
Ser Arg Leu Phe Glu Arg Phe His Leu Glu Gly Glu Leu Gln Arg Thr
    210                 215                 220

act gga aat tca atc cat caa gca caa gac ggt aca acc act aca gct      720
Thr Gly Asn Ser Ile His Gln Ala Gln Asp Gly Thr Thr Thr Thr Ala
225                 230                 235                 240

cct tat ggt gac tcc ttg ctg agc gag gag gtt gca agt gca ctt gcg      768
Pro Tyr Gly Asp Ser Leu Leu Ser Glu Glu Val Ala Ser Ala Leu Ala
                245                 250                 255

gaa ctc ctc ccc gta tgg tct cag ctg atc gaa gag cat agc ctt caa      816
Glu Leu Leu Pro Val Trp Ser Gln Leu Ile Glu Glu His Ser Leu Gln
            260                 265                 270

gac ctc aag gcg agc cct cag gcg aag cgg ctc gac agt gtg agc ttc      864
Asp Leu Lys Ala Ser Pro Gln Ala Lys Arg Leu Asp Ser Val Ser Phe
        275                 280                 285

gcg cac tac tgt gag aag gaa cta aac ttg cct gct gtt ctc ggc gta      912
Ala His Tyr Cys Glu Lys Glu Leu Asn Leu Pro Ala Val Leu Gly Val
    290                 295                 300

gca aac cag atc aca cgc gct ctg ctc ggt gtg gaa gcc cac gag atc      960
Ala Asn Gln Ile Thr Arg Ala Leu Leu Gly Val Glu Ala His Glu Ile
305                 310                 315                 320

agc atg ctt ttt ctc acc gac tac atc aag agt gcc acc ggt ctc agt     1008
Ser Met Leu Phe Leu Thr Asp Tyr Ile Lys Ser Ala Thr Gly Leu Ser
                325                 330                 335

aat att ttc tcg gac aag aaa gac ggc ggg cag tat atg cga tgc aaa     1056
Asn Ile Phe Ser Asp Lys Lys Asp Gly Gly Gln Tyr Met Arg Cys Lys
            340                 345                 350

aca ggt atg cag tcg att tgc cat gcc atg tca aag gaa ctt gtt cca     1104
Thr Gly Met Gln Ser Ile Cys His Ala Met Ser Lys Glu Leu Val Pro
        355                 360                 365

ggc tca gtg cac ctc aac acc ccc gtc gct gaa att gag cag tcg gca     1152
Gly Ser Val His Leu Asn Thr Pro Val Ala Glu Ile Glu Gln Ser Ala
    370                 375                 380

tcc ggc tgt aca gta cga tcg gcc tcg ggc gcc gtg ttc cga agc aaa     1200
Ser Gly Cys Thr Val Arg Ser Ala Ser Gly Ala Val Phe Arg Ser Lys
385                 390                 395                 400

aag gtg gtg gtt tcg tta ccg aca acc ttg tat ccc acc ttg aca ttt     1248
Lys Val Val Val Ser Leu Pro Thr Thr Leu Tyr Pro Thr Leu Thr Phe
                405                 410                 415

tca cca cct ctt ccc gcc gag aag caa gca ttg gcg gaa aat tct atc     1296
Ser Pro Pro Leu Pro Ala Glu Lys Gln Ala Leu Ala Glu Asn Ser Ile
            420                 425                 430
```

```
ctg ggc tac tat agc aag ata gtc ttc gta tgg gac aag ccg tgg tgg     1344
Leu Gly Tyr Tyr Ser Lys Ile Val Phe Val Trp Asp Lys Pro Trp Trp
        435                 440                 445

cgc gaa caa ggc ttc tcg ggc gtc ctc caa tcg agc tgt gac ccc atc     1392
Arg Glu Gln Gly Phe Ser Gly Val Leu Gln Ser Ser Cys Asp Pro Ile
    450                 455                 460

tca ttt gcc aga gat acc agc atc gac gtc gat cga caa tgg tcc att     1440
Ser Phe Ala Arg Asp Thr Ser Ile Asp Val Asp Arg Gln Trp Ser Ile
465                 470                 475                 480

acc tgt ttc atg gtc gga gac ccg gga cgg aag tgg tcc caa cag tcc     1488
Thr Cys Phe Met Val Gly Asp Pro Gly Arg Lys Trp Ser Gln Gln Ser
                485                 490                 495

aag cag gta cga caa aag tct gtc tgg gac caa ctc cgc gca gcc tac     1536
Lys Gln Val Arg Gln Lys Ser Val Trp Asp Gln Leu Arg Ala Ala Tyr
            500                 505                 510

gag aac gcc ggg gcc caa gtc cca gag ccg gcc aac gtg ctc gaa atc     1584
Glu Asn Ala Gly Ala Gln Val Pro Glu Pro Ala Asn Val Leu Glu Ile
        515                 520                 525

gag tgg tcg aag cag cag tat ttc caa gga gct ccg agc gcc gtc tat     1632
Glu Trp Ser Lys Gln Gln Tyr Phe Gln Gly Ala Pro Ser Ala Val Tyr
    530                 535                 540

ggg ctg aac gat ctc atc aca ctg ggt tcg gcg ctc aga acg ccg ttc     1680
Gly Leu Asn Asp Leu Ile Thr Leu Gly Ser Ala Leu Arg Thr Pro Phe
545                 550                 555                 560

aag agt gtt cat ttc gtt gga acg gag acg tct tta gtt tgg aaa ggg     1728
Lys Ser Val His Phe Val Gly Thr Glu Thr Ser Leu Val Trp Lys Gly
                565                 570                 575

tat atg gaa ggg gcc ata cga tcg ggt caa cga ggt gct gca gaa gtt     1776
Tyr Met Glu Gly Ala Ile Arg Ser Gly Gln Arg Gly Ala Ala Glu Val
            580                 585                 590

gtg gct agc ctg gtg cca gca gca tag                                1803
Val Ala Ser Leu Val Pro Ala Ala
        595                 600
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<210> 23
<211> 600
<212> PRT
<213> Exophiala spinifera

<400> 23

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Met Ala Leu Ala Pro Ser Tyr Ile Asn Pro Pro Asn Val Ala Ser Pro
 1               5                  10                  15
Ala Gly Tyr Ser His Val Gly Val Gly Pro Asp Gly Gly Arg Tyr Val
            20                  25                  30
Thr Ile Ala Gly Gln Ile Gly Gln Asp Ala Ser Gly Val Thr Asp Pro
        35                  40                  45
Ala Tyr Glu Lys Gln Val Ala Gln Ala Phe Ala Asn Leu Arg Ala Cys
    50                  55                  60
Leu Ala Ala Val Gly Ala Thr Ser Asn Asp Val Thr Lys Leu Asn Tyr
65                  70                  75                  80
Tyr Ile Val Asp Tyr Ala Pro Ser Lys Leu Thr Ala Ile Gly Asp Gly
```

```
                85                  90                  95
Leu Lys Ala Thr Phe Ala Leu Asp Arg Leu Pro Pro Cys Thr Leu Val
            100                 105                 110
Pro Val Ser Ala Leu Ser Ser Pro Glu Tyr Leu Phe Glu Val Asp Ala
        115                 120                 125
Thr Ala Leu Val Pro Gly His Thr Thr Pro Asp Asn Val Ala Asp Val
    130                 135                 140
Val Val Val Gly Ala Gly Leu Ser Gly Leu Glu Thr Ala Arg Lys Val
145                 150                 155                 160
Gln Ala Ala Gly Leu Ser Cys Leu Val Leu Glu Ala Met Asp Arg Val
                165                 170                 175
Gly Gly Lys Thr Leu Ser Val Gln Ser Gly Pro Gly Arg Thr Thr Ile
            180                 185                 190
Asn Asp Leu Gly Ala Ala Trp Ile Asn Asp Ser Asn Gln Ser Glu Val
        195                 200                 205
Ser Arg Leu Phe Glu Arg Phe His Leu Glu Gly Glu Leu Gln Arg Thr
    210                 215                 220
Thr Gly Asn Ser Ile His Gln Ala Gln Asp Gly Thr Thr Thr Thr Ala
225                 230                 235                 240
Pro Tyr Gly Asp Ser Leu Leu Ser Glu Glu Val Ala Ser Ala Leu Ala
                245                 250                 255
Glu Leu Leu Pro Val Trp Ser Gln Leu Ile Glu Glu His Ser Leu Gln
            260                 265                 270
Asp Leu Lys Ala Ser Pro Gln Ala Lys Arg Leu Asp Ser Val Ser Phe
        275                 280                 285
Ala His Tyr Cys Glu Lys Glu Leu Asn Leu Pro Ala Val Leu Gly Val
    290                 295                 300
Ala Asn Gln Ile Thr Arg Ala Leu Leu Gly Val Glu Ala His Glu Ile
305                 310                 315                 320
Ser Met Leu Phe Leu Thr Asp Tyr Ile Lys Ser Ala Thr Gly Leu Ser
                325                 330                 335
Asn Ile Phe Ser Asp Lys Lys Asp Gly Gly Gln Tyr Met Arg Cys Lys
            340                 345                 350
Thr Gly Met Gln Ser Ile Cys His Ala Met Ser Lys Glu Leu Val Pro
        355                 360                 365
Gly Ser Val His Leu Asn Thr Pro Val Ala Glu Ile Glu Gln Ser Ala
    370                 375                 380
Ser Gly Cys Thr Val Arg Ser Ala Ser Gly Ala Val Phe Arg Ser Lys
385                 390                 395                 400
Lys Val Val Val Ser Leu Pro Thr Thr Leu Tyr Pro Thr Leu Thr Phe
                405                 410                 415
Ser Pro Pro Leu Pro Ala Glu Lys Gln Ala Leu Ala Glu Asn Ser Ile
            420                 425                 430
Leu Gly Tyr Tyr Ser Lys Ile Val Phe Val Trp Asp Lys Pro Trp Trp
        435                 440                 445
Arg Glu Gln Gly Phe Ser Gly Val Leu Gln Ser Ser Cys Asp Pro Ile
    450                 455                 460
Ser Phe Ala Arg Asp Thr Ser Ile Asp Val Asp Arg Gln Trp Ser Ile
465                 470                 475                 480
Thr Cys Phe Met Val Gly Asp Pro Gly Arg Lys Trp Ser Gln Gln Ser
                485                 490                 495
Lys Gln Val Arg Gln Lys Ser Val Trp Asp Gln Leu Arg Ala Ala Tyr
            500                 505                 510
Glu Asn Ala Gly Ala Gln Val Pro Glu Pro Ala Asn Val Leu Glu Ile
        515                 520                 525
Glu Trp Ser Lys Gln Gln Tyr Phe Gln Gly Ala Pro Ser Ala Val Tyr
    530                 535                 540
Gly Leu Asn Asp Leu Ile Thr Leu Gly Ser Ala Leu Arg Thr Pro Phe
545                 550                 555                 560
Lys Ser Val His Phe Val Gly Thr Glu Thr Ser Leu Val Trp Lys Gly
                565                 570                 575
Tyr Met Glu Gly Ala Ile Arg Ser Gly Gln Arg Gly Ala Ala Glu Val
```

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            580                 585                 590
Val Ala Ser Leu Val Pro Ala Ala
        595                 600
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<210> 24
<211> 3003
<212> DNA
<213> Unknown

<220>
<223> Sequence is a barley alpha amylase signal sequence: espl mat: an artificial spacer sequence and K:trAPAO

<221> sig_peptide
<222> (1)...(72)
<223> Barley alpha amylase signal sequence

<221> misc_feature
<222> (73)...(1575)
<223> espl mat

<221> misc_feature
<222> (1576)...(1611)
<223> spacer sequence

<221> misc_feature
<222> (1612)...(3000)
<223> K:trAPAO

<221> CDS
<222> (1)...(3000)

<221> misc_feature
<222> (1612)...(1614)
<223> Extra lysine

<400> 24

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atg gcc aac aag cac ctg agc ctc tcc ctc ttc ctc gtg ctc ctc ggc       48
Met Ala Asn Lys His Leu Ser Leu Ser Leu Phe Leu Val Leu Leu Gly
               -20                 -15                 -10

ctc tcc gcc tcc ctc gcc agc ggc gct cct act gtc aag att gat gct       96
Leu Ser Ala Ser Leu Ala Ser Gly Ala Pro Thr Val Lys Ile Asp Ala
            -5                  1               5

ggg atg gtg gtc ggc acg act act act gtc ccc ggc acc act gcg acc      144
Gly Met Val Val Gly Thr Thr Thr Thr Val Pro Gly Thr Thr Ala Thr
     10                  15                  20

gtc agc gag ttc ttg ggc gtt cct ttt gcc gcc tct ccg aca cga ttt      192
Val Ser Glu Phe Leu Gly Val Pro Phe Ala Ala Ser Pro Thr Arg Phe
 25                  30                  35                  40

gcg cct cct act cgt ccc gtg cct tgg tca acg cct ttg caa gcc act      240
Ala Pro Pro Thr Arg Pro Val Pro Trp Ser Thr Pro Leu Gln Ala Thr
                45                  50                  55

gca tat ggt cca gca tgc cct caa caa ttc aat tac ccc gaa gaa ctc      288
Ala Tyr Gly Pro Ala Cys Pro Gln Gln Phe Asn Tyr Pro Glu Glu Leu
            60                  65                  70
```

```
cgt gag att acg atg gcc tgg ttc aat aca ccg ccc ccg tca gct ggt      336
Arg Glu Ile Thr Met Ala Trp Phe Asn Thr Pro Pro Pro Ser Ala Gly
         75                  80                  85

gaa agt gag gac tgc ctg aac ctc aac atc tac gtc cca gga act gag      384
Glu Ser Glu Asp Cys Leu Asn Leu Asn Ile Tyr Val Pro Gly Thr Glu
     90                  95                 100

aac aca aac aaa gcc gtc atg gtt tgg ata tac ggt gga gcg ctg gaa      432
Asn Thr Asn Lys Ala Val Met Val Trp Ile Tyr Gly Gly Ala Leu Glu
105                 110                 115                 120

tat ggt tgg aat tca ttc cac ctt tac gac ggg gct agt ttc gca gcc      480
Tyr Gly Trp Asn Ser Phe His Leu Tyr Asp Gly Ala Ser Phe Ala Ala
                125                 130                 135

aat cag gat gtc atc gcc gtg acc atc aac tac aga acg aac att ctg      528
Asn Gln Asp Val Ile Ala Val Thr Ile Asn Tyr Arg Thr Asn Ile Leu
            140                 145                 150

ggg ttc cct gct gcc cct cag ctt cca ata aca cag cga aat ctg ggg      576
Gly Phe Pro Ala Ala Pro Gln Leu Pro Ile Thr Gln Arg Asn Leu Gly
        155                 160                 165

ttc cta gac caa agg ttt gct ttg gat tgg gta cag cgg aac atc gca      624
Phe Leu Asp Gln Arg Phe Ala Leu Asp Trp Val Gln Arg Asn Ile Ala
    170                 175                 180

gcc ttt ggc ggt gat cct cga aag gtc aca ata ttt ggg cag agt gcg      672
Ala Phe Gly Gly Asp Pro Arg Lys Val Thr Ile Phe Gly Gln Ser Ala
185                 190                 195                 200

ggg ggc aga agt gtc gac gtc ctc ttg acg tct atg cca cac aac cca      720
Gly Gly Arg Ser Val Asp Val Leu Leu Thr Ser Met Pro His Asn Pro
                205                 210                 215

ccc ttc cga gca gca atc atg gag tcc ggt gtg gct aac tac aac ttc      768
Pro Phe Arg Ala Ala Ile Met Glu Ser Gly Val Ala Asn Tyr Asn Phe
            220                 225                 230

ccc aag gga gat ttg tcc gaa cct tgg aac acc act gtt caa gct ctc      816
Pro Lys Gly Asp Leu Ser Glu Pro Trp Asn Thr Thr Val Gln Ala Leu
        235                 240                 245

aac tgt acc acc agt atc gac atc ttg agt tgt atg aga aga gtc gat      864
Asn Cys Thr Thr Ser Ile Asp Ile Leu Ser Cys Met Arg Arg Val Asp
    250                 255                 260

ctc gcc act ctg atg aac acg atc gag caa ctc gga ctt ggg ttt gag      912
Leu Ala Thr Leu Met Asn Thr Ile Glu Gln Leu Gly Leu Gly Phe Glu
265                 270                 275                 280

tac acg ttg gac aac gta acg gct gtg tac cgt tct gaa acg gct cgc      960
Tyr Thr Leu Asp Asn Val Thr Ala Val Tyr Arg Ser Glu Thr Ala Arg
                285                 290                 295

acg act ggt gac att gct cgt gta cct gtt ctc gtc ggg acg gtg gcc     1008
Thr Thr Gly Asp Ile Ala Arg Val Pro Val Leu Val Gly Thr Val Ala
            300                 305                 310

aac gac gga ctt ctc ttt gtc ctc ggg gag aat gac acc caa gca tat     1056
Asn Asp Gly Leu Leu Phe Val Leu Gly Glu Asn Asp Thr Gln Ala Tyr
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        315                 320                 325

ctc gag gag gca atc ccg aat cag ccc gac ctt tac cag act ctc ctt     1104
Leu Glu Glu Ala Ile Pro Asn Gln Pro Asp Leu Tyr Gln Thr Leu Leu
    330                 335                 340

gga gca tat ccc att gga tcc cca ggg atc gga tcg cct caa gat cag     1152
Gly Ala Tyr Pro Ile Gly Ser Pro Gly Ile Gly Ser Pro Gln Asp Gln
345                 350                 355                 360

att gcc gcc att gag acc gag gta aga ttc cag tgt cct tct gcc atc     1200
Ile Ala Ala Ile Glu Thr Glu Val Arg Phe Gln Cys Pro Ser Ala Ile
                365                 370                 375

gtg gct cag gac tcc cgg aat cgg ggt atc cct tct tgg cgc tac tac     1248
Val Ala Gln Asp Ser Arg Asn Arg Gly Ile Pro Ser Trp Arg Tyr Tyr
            380                 385                 390

tac aat gcg acc ttt gag aat ctg gag ctt ttc cct ggg tcc gaa gtg     1296
Tyr Asn Ala Thr Phe Glu Asn Leu Glu Leu Phe Pro Gly Ser Glu Val
        395                 400                 405

tac cac agc tct gaa gtc ggg atg gtg ttt ggc acg tat cct gtc gca     1344
Tyr His Ser Ser Glu Val Gly Met Val Phe Gly Thr Tyr Pro Val Ala
    410                 415                 420

agt gcg acc gcc ttg gag gcc cag acg agc aaa tac atg cag ggt gcc     1392
Ser Ala Thr Ala Leu Glu Ala Gln Thr Ser Lys Tyr Met Gln Gly Ala
425                 430                 435                 440

tgg gcg gcc ttt gcc aaa aac ccc atg aat ggg cct ggg tgg aaa caa     1440
Trp Ala Ala Phe Ala Lys Asn Pro Met Asn Gly Pro Gly Trp Lys Gln
                445                 450                 455

gtg ccg aat gtc gcg gcg ctt ggc tca cca ggc aaa gcc atc cag gtt     1488
Val Pro Asn Val Ala Ala Leu Gly Ser Pro Gly Lys Ala Ile Gln Val
            460                 465                 470

gac gtc tct cca gcg aca ata gac caa cga tgt gcc ttg tac acg cgt     1536
Asp Val Ser Pro Ala Thr Ile Asp Gln Arg Cys Ala Leu Tyr Thr Arg
        475                 480                 485

tat tat act gag ttg ggc aca atc gcg ccg agg aca ttt ggc gga ggc     1584
Tyr Tyr Thr Glu Leu Gly Thr Ile Ala Pro Arg Thr Phe Gly Gly Gly
    490                 495                 500

agc ggc gga ggc agc ggc gga ggc agc aaa gac aac gtt gcg gac gtg     1632
Ser Gly Gly Gly Ser Gly Gly Gly Ser Lys Asp Asn Val Ala Asp Val
505                 510                 515                 520

gta gtg gtg ggc gct ggc ttg agc ggt ttg gag acg gca cgc aaa gtc     1680
Val Val Val Gly Ala Gly Leu Ser Gly Leu Glu Thr Ala Arg Lys Val
                525                 530                 535

cag gcc gcc ggt ctg tcc tgc ctc gtt ctt gag gcg atg gat cgt gta     1728
Gln Ala Ala Gly Leu Ser Cys Leu Val Leu Glu Ala Met Asp Arg Val
            540                 545                 550

ggg gga aag act ctg agc gta caa tcg ggt ccc ggc agg acg act atc     1776
Gly Gly Lys Thr Leu Ser Val Gln Ser Gly Pro Gly Arg Thr Thr Ile
        555                 560                 565
```

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aac gac ctc ggc gct gcg tgg atc aat gac agc aac caa agc gaa gta      1824
Asn Asp Leu Gly Ala Ala Trp Ile Asn Asp Ser Asn Gln Ser Glu Val
    570                 575                 580

tcc aga ttg ttt gaa aga ttt cat ttg gag ggc gag ctc cag agg acg      1872
Ser Arg Leu Phe Glu Arg Phe His Leu Glu Gly Glu Leu Gln Arg Thr
585                 590                 595                 600

act gga aat tca atc cat caa gca caa gac ggt aca acc act aca gct      1920
Thr Gly Asn Ser Ile His Gln Ala Gln Asp Gly Thr Thr Thr Thr Ala
                605                 610                 615

cct tat ggt gac tcc ttg ctg agc gag gag gtt gca agt gca ctt gcg      1968
Pro Tyr Gly Asp Ser Leu Leu Ser Glu Glu Val Ala Ser Ala Leu Ala
            620                 625                 630

gaa ctc ctc ccc gta tgg tct cag ctg atc gaa gag cat agc ctt caa      2016
Glu Leu Leu Pro Val Trp Ser Gln Leu Ile Glu Glu His Ser Leu Gln
        635                 640                 645

gac ctc aag gcg agc cct cag gcg aag cgg ctc gac agt gtg agc ttc      2064
Asp Leu Lys Ala Ser Pro Gln Ala Lys Arg Leu Asp Ser Val Ser Phe
    650                 655                 660

gcg cac tac tgt gag aag gaa cta aac ttg cct gct gtt ctc ggc gta      2112
Ala His Tyr Cys Glu Lys Glu Leu Asn Leu Pro Ala Val Leu Gly Val
665                 670                 675                 680

gca aac cag atc aca cgc gct ctg ctc ggt gtg gaa gcc cac gag atc      2160
Ala Asn Gln Ile Thr Arg Ala Leu Leu Gly Val Glu Ala His Glu Ile
                685                 690                 695

agc atg ctt ttt ctc acc gac tac atc aag agt gcc acc ggt ctc agt      2208
Ser Met Leu Phe Leu Thr Asp Tyr Ile Lys Ser Ala Thr Gly Leu Ser
            700                 705                 710

aat att ttc tcg gac aag aaa gac ggc ggg cag tat atg cga tgc aaa      2256
Asn Ile Phe Ser Asp Lys Lys Asp Gly Gly Gln Tyr Met Arg Cys Lys
        715                 720                 725

aca ggt atg cag tcg att tgc cat gcc atg tca aag gaa ctt gtt cca      2304
Thr Gly Met Gln Ser Ile Cys His Ala Met Ser Lys Glu Leu Val Pro
    730                 735                 740

ggc tca gtg cac ctc aac acc ccc gtc gct gaa att gag cag tcg gca      2352
Gly Ser Val His Leu Asn Thr Pro Val Ala Glu Ile Glu Gln Ser Ala
745                 750                 755                 760

tcc ggc tgt aca gta cga tcg gcc tcg ggc gcc gtg ttc cga agc aaa      2400
Ser Gly Cys Thr Val Arg Ser Ala Ser Gly Ala Val Phe Arg Ser Lys
                765                 770                 775

aag gtg gtg gtt tcg tta ccg aca acc ttg tat ccc acc ttg aca ttt      2448
Lys Val Val Val Ser Leu Pro Thr Thr Leu Tyr Pro Thr Leu Thr Phe
            780                 785                 790

tca cca cct ctt ccc gcc gag aag caa gca ttg gcg gaa aat tct atc      2496
Ser Pro Pro Leu Pro Ala Glu Lys Gln Ala Leu Ala Glu Asn Ser Ile
        795                 800                 805

ctg ggc tac tat agc aag ata gtc ttc gta tgg gac aag ccg tgg tgg      2544
Leu Gly Tyr Tyr Ser Lys Ile Val Phe Val Trp Asp Lys Pro Trp Trp
```

```
    810                 815                 820

cgc gaa caa ggc ttc tcg ggc gtc ctc caa tcg agc tgt gac ccc atc     2592
Arg Glu Gln Gly Phe Ser Gly Val Leu Gln Ser Ser Cys Asp Pro Ile
825                 830                 835                 840

tca ttt gcc aga gat acc agc atc gac gtc gat cga caa tgg tcc att     2640
Ser Phe Ala Arg Asp Thr Ser Ile Asp Val Asp Arg Gln Trp Ser Ile
                845                 850                 855

acc tgt ttc atg gtc gga gac ccg gga cgg aag tgg tcc caa cag tcc     2688
Thr Cys Phe Met Val Gly Asp Pro Gly Arg Lys Trp Ser Gln Gln Ser
            860                 865                 870

aag cag gta cga caa aag tct gtc tgg gac caa ctc cgc gca gcc tac     2736
Lys Gln Val Arg Gln Lys Ser Val Trp Asp Gln Leu Arg Ala Ala Tyr
        875                 880                 885

gag aac gcc ggg gcc caa gtc cca gag ccg gcc aac gtg ctc gaa atc     2784
Glu Asn Ala Gly Ala Gln Val Pro Glu Pro Ala Asn Val Leu Glu Ile
    890                 895                 900

gag tgg tcg aag cag cag tat ttc caa gga gct ccg agc gcc gtc tat     2832
Glu Trp Ser Lys Gln Gln Tyr Phe Gln Gly Ala Pro Ser Ala Val Tyr
905                 910                 915                 920

ggg ctg aac gat ctc atc aca ctg ggt tcg gcg ctc aga acg ccg ttc     2880
Gly Leu Asn Asp Leu Ile Thr Leu Gly Ser Ala Leu Arg Thr Pro Phe
                925                 930                 935

aag agt gtt cat ttc gtt gga acg gag acg tct tta gtt tgg aaa ggg     2928
Lys Ser Val His Phe Val Gly Thr Glu Thr Ser Leu Val Trp Lys Gly
            940                 945                 950

tat atg gaa ggg gcc ata cga tcg ggt caa cga ggt gct gca gaa gtt     2976
Tyr Met Glu Gly Ala Ile Arg Ser Gly Gln Arg Gly Ala Ala Glu Val
        955                 960                 965

gtg gct agc ctg gtg cca gca gca tag                                3003
Val Ala Ser Leu Val Pro Ala Ala
    970                 975
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<210> 25
<211> 1000
<212> PRT
<213> Unknown

<220>
<221> SIGNAL
<222> (1)...(24)

<400> 25

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Met Ala Asn Lys His Leu Ser Leu Ser Leu Phe Leu Val Leu Leu Gly
                -20                 -15                 -10
Leu Ser Ala Ser Leu Ala Ser Gly Ala Pro Thr Val Lys Ile Asp Ala
            -5                  1                   5
Gly Met Val Val Gly Thr Thr Thr Thr Val Pro Gly Thr Thr Ala Thr
    10                  15                  20
Val Ser Glu Phe Leu Gly Val Pro Phe Ala Ala Ser Pro Thr Arg Phe
25                  30                  35                  40
Ala Pro Pro Thr Arg Pro Val Pro Trp Ser Thr Pro Leu Gln Ala Thr
```

```
                   45                  50                  55
Ala Tyr Gly Pro Ala Cys Pro Gln Gln Phe Asn Tyr Pro Glu Glu Leu
               60                  65                  70
Arg Glu Ile Thr Met Ala Trp Phe Asn Thr Pro Pro Pro Ser Ala Gly
           75                  80                  85
Glu Ser Glu Asp Cys Leu Asn Leu Asn Ile Tyr Val Pro Gly Thr Glu
       90                  95                 100
Asn Thr Asn Lys Ala Val Met Val Trp Ile Tyr Gly Gly Ala Leu Glu
  105                 110                 115                 120
Tyr Gly Trp Asn Ser Phe His Leu Tyr Asp Gly Ala Ser Phe Ala Ala
                  125                 130                 135
Asn Gln Asp Val Ile Ala Val Thr Ile Asn Tyr Arg Thr Asn Ile Leu
              140                 145                 150
Gly Phe Pro Ala Ala Pro Gln Leu Pro Ile Thr Gln Arg Asn Leu Gly
          155                 160                 165
Phe Leu Asp Gln Arg Phe Ala Leu Asp Trp Val Gln Arg Asn Ile Ala
      170                 175                 180
Ala Phe Gly Gly Asp Pro Arg Lys Val Thr Ile Phe Gly Gln Ser Ala
  185                 190                 195                 200
Gly Gly Arg Ser Val Asp Val Leu Leu Thr Ser Met Pro His Asn Pro
                  205                 210                 215
Pro Phe Arg Ala Ala Ile Met Glu Ser Gly Val Ala Asn Tyr Asn Phe
              220                 225                 230
Pro Lys Gly Asp Leu Ser Glu Pro Trp Asn Thr Thr Val Gln Ala Leu
          235                 240                 245
Asn Cys Thr Thr Ser Ile Asp Ile Leu Ser Cys Met Arg Arg Val Asp
      250                 255                 260
Leu Ala Thr Leu Met Asn Thr Ile Glu Gln Leu Gly Leu Gly Phe Glu
  265                 270                 275                 280
Tyr Thr Leu Asp Asn Val Thr Ala Val Tyr Arg Ser Glu Thr Ala Arg
                  285                 290                 295
Thr Thr Gly Asp Ile Ala Arg Val Pro Val Leu Val Gly Thr Val Ala
              300                 305                 310
Asn Asp Gly Leu Leu Phe Val Leu Gly Glu Asn Asp Thr Gln Ala Tyr
          315                 320                 325
Leu Glu Glu Ala Ile Pro Asn Gln Pro Asp Leu Tyr Gln Thr Leu Leu
      330                 335                 340
Gly Ala Tyr Pro Ile Gly Ser Pro Gly Ile Gly Ser Pro Gln Asp Gln
  345                 350                 355                 360
Ile Ala Ala Ile Glu Thr Glu Val Arg Phe Gln Cys Pro Ser Ala Ile
                  365                 370                 375
Val Ala Gln Asp Ser Arg Asn Arg Gly Ile Pro Ser Trp Arg Tyr Tyr
              380                 385                 390
Tyr Asn Ala Thr Phe Glu Asn Leu Glu Leu Phe Pro Gly Ser Glu Val
          395                 400                 405
Tyr His Ser Ser Glu Val Gly Met Val Phe Gly Thr Tyr Pro Val Ala
      410                 415                 420
Ser Ala Thr Ala Leu Glu Ala Gln Thr Ser Lys Tyr Met Gln Gly Ala
  425                 430                 435                 440
Trp Ala Ala Phe Ala Lys Asn Pro Met Asn Gly Pro Gly Trp Lys Gln
                  445                 450                 455
Val Pro Asn Val Ala Ala Leu Gly Ser Pro Gly Lys Ala Ile Gln Val
              460                 465                 470
Asp Val Ser Pro Ala Thr Ile Asp Gln Arg Cys Ala Leu Tyr Thr Arg
          475                 480                 485
Tyr Tyr Thr Glu Leu Gly Thr Ile Ala Pro Arg Thr Phe Gly Gly Gly
      490                 495                 500
Ser Gly Gly Gly Ser Gly Gly Gly Ser Lys Asp Asn Val Ala Asp Val
  505                 510                 515                 520
Val Val Val Gly Ala Gly Leu Ser Gly Leu Glu Thr Ala Arg Lys Val
                  525                 530                 535
Gln Ala Ala Gly Leu Ser Cys Leu Val Leu Glu Ala Met Asp Arg Val
```

```
                540                 545                 550
Gly Gly Lys Thr Leu Ser Val Gln Ser Gly Pro Gly Arg Thr Thr Ile
        555                 560                 565
Asn Asp Leu Gly Ala Ala Trp Ile Asn Asp Ser Asn Gln Ser Glu Val
    570                 575                 580
Ser Arg Leu Phe Glu Arg Phe His Leu Glu Gly Glu Leu Gln Arg Thr
585                 590                 595                 600
Thr Gly Asn Ser Ile His Gln Ala Gln Asp Gly Thr Thr Thr Thr Ala
                605                 610                 615
Pro Tyr Gly Asp Ser Leu Leu Ser Glu Glu Val Ala Ser Ala Leu Ala
            620                 625                 630
Glu Leu Leu Pro Val Trp Ser Gln Leu Ile Glu Glu His Ser Leu Gln
        635                 640                 645
Asp Leu Lys Ala Ser Pro Gln Ala Lys Arg Leu Asp Ser Val Ser Phe
    650                 655                 660
Ala His Tyr Cys Glu Lys Glu Leu Asn Leu Pro Ala Val Leu Gly Val
665                 670                 675                 680
Ala Asn Gln Ile Thr Arg Ala Leu Leu Gly Val Glu Ala His Glu Ile
                685                 690                 695
Ser Met Leu Phe Leu Thr Asp Tyr Ile Lys Ser Ala Thr Gly Leu Ser
            700                 705                 710
Asn Ile Phe Ser Asp Lys Lys Asp Gly Gly Gln Tyr Met Arg Cys Lys
        715                 720                 725
Thr Gly Met Gln Ser Ile Cys His Ala Met Ser Lys Glu Leu Val Pro
    730                 735                 740
Gly Ser Val His Leu Asn Thr Pro Val Ala Glu Ile Glu Gln Ser Ala
745                 750                 755                 760
Ser Gly Cys Thr Val Arg Ser Ala Ser Gly Ala Val Phe Arg Ser Lys
                765                 770                 775
Lys Val Val Val Ser Leu Pro Thr Thr Leu Tyr Pro Thr Leu Thr Phe
            780                 785                 790
Ser Pro Pro Leu Pro Ala Glu Lys Gln Ala Leu Ala Glu Asn Ser Ile
        795                 800                 805
Leu Gly Tyr Tyr Ser Lys Ile Val Phe Val Trp Asp Lys Pro Trp Trp
    810                 815                 820
Arg Glu Gln Gly Phe Ser Gly Val Leu Gln Ser Ser Cys Asp Pro Ile
825                 830                 835                 840
Ser Phe Ala Arg Asp Thr Ser Ile Asp Val Asp Arg Gln Trp Ser Ile
                845                 850                 855
Thr Cys Phe Met Val Gly Asp Pro Gly Arg Lys Trp Ser Gln Gln Ser
            860                 865                 870
Lys Gln Val Arg Gln Lys Ser Val Trp Asp Gln Leu Arg Ala Ala Tyr
        875                 880                 885
Glu Asn Ala Gly Ala Gln Val Pro Glu Pro Ala Asn Val Leu Glu Ile
    890                 895                 900
Glu Trp Ser Lys Gln Gln Tyr Phe Gln Gly Ala Pro Ser Ala Val Tyr
905                 910                 915                 920
Gly Leu Asn Asp Leu Ile Thr Leu Gly Ser Ala Leu Arg Thr Pro Phe
                925                 930                 935
Lys Ser Val His Phe Val Gly Thr Glu Thr Ser Leu Val Trp Lys Gly
            940                 945                 950
Tyr Met Glu Gly Ala Ile Arg Ser Gly Gln Arg Gly Ala Ala Glu Val
        955                 960                 965
Val Ala Ser Leu Val Pro Ala Ala
    970                 975
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<210> 26
<211> 2976
<212> DNA
<213> Unknown

<220>

<223> Barley alpha amylase signal sequence: BEST1 mature: artificial spacer: and K:trAPAO. For plant expression.

<221> sig_peptide
<222> (1)...(72)
<223> Barley alpha amylase signal sequence.

<221> mat_peptide
<222> (73)...(1545)
<223> BEST1 mature

<221> misc_feature
<222> (1546)...(1584)
<223> Artificial spacer sequence

<221> misc_feature
<222> (1585)...(2973)
<223> K:trAPAO

<221> CDS
<222> (1)...(2973)

<221> misc_feature
<222> (1585)...(1587)
<223> Extra lysine

<400> 26

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atg gcc aac aag cac ctg agc ctc tcc ctc ttc ctc gtg ctc ctc ggc       48
Met Ala Asn Lys His Leu Ser Leu Ser Leu Phe Leu Val Leu Leu Gly
                -20                 -15                 -10

ctc tcc gcc tcc ctc gcc agc ggc acg gat ttt ccg gtc cgc agg acc       96
Leu Ser Ala Ser Leu Ala Ser Gly Thr Asp Phe Pro Val Arg Arg Thr
            -5                  1               5

gat ctg ggc cag gtt cag gga ctg gcc ggg gac gtg atg agc ttt cgc      144
Asp Leu Gly Gln Val Gln Gly Leu Ala Gly Asp Val Met Ser Phe Arg
     10                  15                  20

gga ata ccc tat gca gcg ccg ccg gtg ggc ggg ctg cgt tgg aag ccg      192
Gly Ile Pro Tyr Ala Ala Pro Pro Val Gly Gly Leu Arg Trp Lys Pro
 25                  30                  35                  40

ccc caa cac gcc cgg ccc tgg gcg ggc gtt cgc ccc gcc acc caa ttt      240
Pro Gln His Ala Arg Pro Trp Ala Gly Val Arg Pro Ala Thr Gln Phe
                45                  50                  55

ggc tcc gac tgc ttc ggc gcg gcc tat ctt cgc aaa ggc agc ctc gcc      288
Gly Ser Asp Cys Phe Gly Ala Ala Tyr Leu Arg Lys Gly Ser Leu Ala
            60                  65                  70

ccc ggc gtg agc gag gac tgt ctt tac ctc aac gta tgg gcg ccg tca      336
Pro Gly Val Ser Glu Asp Cys Leu Tyr Leu Asn Val Trp Ala Pro Ser
         75                  80                  85

ggc gct aaa ccc ggc cag tac ccc gtc atg gtc tgg gtc tac ggc ggc      384
Gly Ala Lys Pro Gly Gln Tyr Pro Val Met Val Trp Val Tyr Gly Gly
     90                  95                  100

ggc ttc gcc ggc ggc acg gcc gcc atg ccc tac tac gac ggc gag gcg      432
Gly Phe Ala Gly Gly Thr Ala Ala Met Pro Tyr Tyr Asp Gly Glu Ala
```

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105                 110                 115                 120

ctt gcg cga cag ggc gtc gtc gtg gtg acg ttt aac tat cgg acg aac      480
Leu Ala Arg Gln Gly Val Val Val Val Thr Phe Asn Tyr Arg Thr Asn
                125                 130                 135

atc ctg ggc ttt ttc gcc cat cct ggt ctc tcg cgc gag agc ccc acc      528
Ile Leu Gly Phe Phe Ala His Pro Gly Leu Ser Arg Glu Ser Pro Thr
            140                 145                 150

gga act tcg ggc aac tac ggc cta ctc gac att ctc gcc gct ctt cgg      576
Gly Thr Ser Gly Asn Tyr Gly Leu Leu Asp Ile Leu Ala Ala Leu Arg
        155                 160                 165

tgg gtg cag agc aac gcc cgc gcc ttc gga ggg gac ccc ggc cga gtg      624
Trp Val Gln Ser Asn Ala Arg Ala Phe Gly Gly Asp Pro Gly Arg Val
    170                 175                 180

acg gtc ttt ggt gaa tcg gcc gga gcg agc gcg atc gga ctt ctg ctc      672
Thr Val Phe Gly Glu Ser Ala Gly Ala Ser Ala Ile Gly Leu Leu Leu
185                 190                 195                 200

acc tcg ccg ctg agc aag ggt ctc ttc cgt ggc gct atc ctc gaa agt      720
Thr Ser Pro Leu Ser Lys Gly Leu Phe Arg Gly Ala Ile Leu Glu Ser
                205                 210                 215

cca ggg ctg acg cga ccg ctc gcg acg ctc gcc gac agc gcc gcc tcg      768
Pro Gly Leu Thr Arg Pro Leu Ala Thr Leu Ala Asp Ser Ala Ala Ser
            220                 225                 230

ggc gag cgc ctc gac gcc gat ctt tcg cga ctg cgc tcg acc gac cca      816
Gly Glu Arg Leu Asp Ala Asp Leu Ser Arg Leu Arg Ser Thr Asp Pro
        235                 240                 245

gcc acc ctg atg gcg cgc gcc gac gcg gcc cgc ccg gca tcg cgg gac      864
Ala Thr Leu Met Ala Arg Ala Asp Ala Ala Arg Pro Ala Ser Arg Asp
    250                 255                 260

ctg cgc agg ccg cgt ccg acc gga ccg atc gtc gat ggc cat gtg ctg      912
Leu Arg Arg Pro Arg Pro Thr Gly Pro Ile Val Asp Gly His Val Leu
265                 270                 275                 280

ccg cag acc gac agc gcg gcg atc gcg gcg ggg cag ctg gcg ccg gtt      960
Pro Gln Thr Asp Ser Ala Ala Ile Ala Ala Gly Gln Leu Ala Pro Val
                285                 290                 295

cgg gtc ctg atc gga acc aat gcc gac gaa ggc cgc gcc ttc ctc ggg     1008
Arg Val Leu Ile Gly Thr Asn Ala Asp Glu Gly Arg Ala Phe Leu Gly
            300                 305                 310

cgc gcg ccg atg gag acg cca gcg gac tac caa gcc tat ctg gag gcg     1056
Arg Ala Pro Met Glu Thr Pro Ala Asp Tyr Gln Ala Tyr Leu Glu Ala
        315                 320                 325

cag ttt ggc gac caa gcc gcc gcc gtg gcg gcg tgc tat ccc ctc gac     1104
Gln Phe Gly Asp Gln Ala Ala Ala Val Ala Ala Cys Tyr Pro Leu Asp
    330                 335                 340

ggc cgg gcc acg ccc aag gaa atg gtc gcg cgc atc ttc ggc gac aat     1152
Gly Arg Ala Thr Pro Lys Glu Met Val Ala Arg Ile Phe Gly Asp Asn
345                 350                 355                 360
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cag ttc aat cgg ggg gtc tcg gcc ttc tcg gaa gcg ctt gtg cgc cag     1200
Gln Phe Asn Arg Gly Val Ser Ala Phe Ser Glu Ala Leu Val Arg Gln
                365                 370                 375

ggc gcg ccc gtg tgg cgt tat cag ttc aac ggt aat acc gag ggt gga     1248
Gly Ala Pro Val Trp Arg Tyr Gln Phe Asn Gly Asn Thr Glu Gly Gly
            380                 385                 390

aga gcg ccg gct acc cac gga gcc gaa att ccc tac gtt ttc ggg gtg     1296
Arg Ala Pro Ala Thr His Gly Ala Glu Ile Pro Tyr Val Phe Gly Val
        395                 400                 405

ttc aag ctc gac gag ttg ggt ctg ttc gat tgg ccg ccc gag ggg ccc     1344
Phe Lys Leu Asp Glu Leu Gly Leu Phe Asp Trp Pro Pro Glu Gly Pro
    410                 415                 420

acg ccc gcc gac cgt gcg ctg ggc caa ctg atg tcc tcc gcc tgg gtc     1392
Thr Pro Ala Asp Arg Ala Leu Gly Gln Leu Met Ser Ser Ala Trp Val
425                 430                 435                 440

cgg ttc gcc aag aat ggc gac ccc gcc ggg gac gcc ctt acc tgg cct     1440
Arg Phe Ala Lys Asn Gly Asp Pro Ala Gly Asp Ala Leu Thr Trp Pro
                445                 450                 455

gcc tat tct acg ggc aag tcg acc atg aca ttc ggt ccc gag ggc cgc     1488
Ala Tyr Ser Thr Gly Lys Ser Thr Met Thr Phe Gly Pro Glu Gly Arg
            460                 465                 470

gcg gcg gtg gtg tcg ccc gga cct tcc atc ccc cct tgc gcg gat ggc     1536
Ala Ala Val Val Ser Pro Gly Pro Ser Ile Pro Pro Cys Ala Asp Gly
        475                 480                 485

gcc aag gcg ggg ggc gga ggc agc ggc gga ggc agc ggc gga ggc agc     1584
Ala Lys Ala Gly Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser
    490                 495                 500

aaa gac aac gtt gcg gac gtg gta gtg gtg ggc gct ggc ttg agc ggt     1632
Lys Asp Asn Val Ala Asp Val Val Val Val Gly Ala Gly Leu Ser Gly
505                 510                 515                 520

ttg gag acg gca cgc aaa gtc cag gcc gcc ggt ctg tcc tgc ctc gtt     1680
Leu Glu Thr Ala Arg Lys Val Gln Ala Ala Gly Leu Ser Cys Leu Val
                525                 530                 535

ctt gag gcg atg gat cgt gta ggg gga aag act ctg agc gta caa tcg     1728
Leu Glu Ala Met Asp Arg Val Gly Gly Lys Thr Leu Ser Val Gln Ser
            540                 545                 550

ggt ccc ggc agg acg act atc aac gac ctc ggc gct gcg tgg atc aat     1776
Gly Pro Gly Arg Thr Thr Ile Asn Asp Leu Gly Ala Ala Trp Ile Asn
        555                 560                 565

gac agc aac caa agc gaa gta tcc aga ttg ttt gaa aga ttt cat ttg     1824
Asp Ser Asn Gln Ser Glu Val Ser Arg Leu Phe Glu Arg Phe His Leu
    570                 575                 580

gag ggc gag ctc cag agg acg act gga aat tca atc cat caa gca caa     1872
Glu Gly Glu Leu Gln Arg Thr Thr Gly Asn Ser Ile His Gln Ala Gln
585                 590                 595                 600

gac ggt aca acc act aca gct cct tat ggt gac tcc ttg ctg agc gag     1920
Asp Gly Thr Thr Thr Thr Ala Pro Tyr Gly Asp Ser Leu Leu Ser Glu
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                605                 610                 615

gag gtt gca agt gca ctt gcg gaa ctc ctc ccc gta tgg tct cag ctg     1968
Glu Val Ala Ser Ala Leu Ala Glu Leu Leu Pro Val Trp Ser Gln Leu
            620                 625                 630

atc gaa gag cat agc ctt caa gac ctc aag gcg agc cct cag gcg aag     2016
Ile Glu Glu His Ser Leu Gln Asp Leu Lys Ala Ser Pro Gln Ala Lys
        635                 640                 645

cgg ctc gac agt gtg agc ttc gcg cac tac tgt gag aag gaa cta aac     2064
Arg Leu Asp Ser Val Ser Phe Ala His Tyr Cys Glu Lys Glu Leu Asn
    650                 655                 660

ttg cct gct gtt ctc ggc gta gca aac cag atc aca cgc gct ctg ctc     2112
Leu Pro Ala Val Leu Gly Val Ala Asn Gln Ile Thr Arg Ala Leu Leu
665                 670                 675                 680

ggt gtg gaa gcc cac gag atc agc atg ctt ttt ctc acc gac tac atc     2160
Gly Val Glu Ala His Glu Ile Ser Met Leu Phe Leu Thr Asp Tyr Ile
                685                 690                 695

aag agt gcc acc ggt ctc agt aat att ttc tcg gac aag aaa gac ggc     2208
Lys Ser Ala Thr Gly Leu Ser Asn Ile Phe Ser Asp Lys Lys Asp Gly
            700                 705                 710

ggg cag tat atg cga tgc aaa aca ggt atg cag tcg att tgc cat gcc     2256
Gly Gln Tyr Met Arg Cys Lys Thr Gly Met Gln Ser Ile Cys His Ala
        715                 720                 725

atg tca aag gaa ctt gtt cca ggc tca gtg cac ctc aac acc ccc gtc     2304
Met Ser Lys Glu Leu Val Pro Gly Ser Val His Leu Asn Thr Pro Val
    730                 735                 740

gct gaa att gag cag tcg gca tcc ggc tgt aca gta cga tcg gcc tcg     2352
Ala Glu Ile Glu Gln Ser Ala Ser Gly Cys Thr Val Arg Ser Ala Ser
745                 750                 755                 760

ggc gcc gtg ttc cga agc aaa aag gtg gtg gtt tcg tta ccg aca acc     2400
Gly Ala Val Phe Arg Ser Lys Lys Val Val Val Ser Leu Pro Thr Thr
                765                 770                 775

ttg tat ccc acc ttg aca ttt tca cca cct ctt ccc gcc gag aag caa     2448
Leu Tyr Pro Thr Leu Thr Phe Ser Pro Pro Leu Pro Ala Glu Lys Gln
            780                 785                 790

gca ttg gcg gaa aat tct atc ctg ggc tac tat agc aag ata gtc ttc     2496
Ala Leu Ala Glu Asn Ser Ile Leu Gly Tyr Tyr Ser Lys Ile Val Phe
        795                 800                 805

gta tgg gac aag ccg tgg tgg cgc gaa caa ggc ttc tcg ggc gtc ctc     2544
Val Trp Asp Lys Pro Trp Trp Arg Glu Gln Gly Phe Ser Gly Val Leu
    810                 815                 820

caa tcg agc tgt gac ccc atc tca ttt gcc aga gat acc agc atc gac     2592
Gln Ser Ser Cys Asp Pro Ile Ser Phe Ala Arg Asp Thr Ser Ile Asp
825                 830                 835                 840

gtc gat cga caa tgg tcc att acc tgt ttc atg gtc gga gac ccg gga     2640
Val Asp Arg Gln Trp Ser Ile Thr Cys Phe Met Val Gly Asp Pro Gly
                845                 850                 855
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cgg aag tgg tcc caa cag tcc aag cag gta cga caa aag tct gtc tgg     2688
Arg Lys Trp Ser Gln Gln Ser Lys Gln Val Arg Gln Lys Ser Val Trp
            860                 865                 870

gac caa ctc cgc gca gcc tac gag aac gcc ggg gcc caa gtc cca gag     2736
Asp Gln Leu Arg Ala Ala Tyr Glu Asn Ala Gly Ala Gln Val Pro Glu
        875                 880                 885

ccg gcc aac gtg ctc gaa atc gag tgg tcg aag cag cag tat ttc caa     2784
Pro Ala Asn Val Leu Glu Ile Glu Trp Ser Lys Gln Gln Tyr Phe Gln
    890                 895                 900

gga gct ccg agc gcc gtc tat ggg ctg aac gat ctc atc aca ctg ggt     2832
Gly Ala Pro Ser Ala Val Tyr Gly Leu Asn Asp Leu Ile Thr Leu Gly
905                 910                 915                 920

tcg gcg ctc aga acg ccg ttc aag agt gtt cat ttc gtt gga acg gag     2880
Ser Ala Leu Arg Thr Pro Phe Lys Ser Val His Phe Val Gly Thr Glu
                925                 930                 935

acg tct tta gtt tgg aaa ggg tat atg gaa ggg gcc ata cga tcg ggt     2928
Thr Ser Leu Val Trp Lys Gly Tyr Met Glu Gly Ala Ile Arg Ser Gly
            940                 945                 950

caa cga ggt gct gca gaa gtt gtg gct agc ctg gtg cca gca gca         2973
Gln Arg Gly Ala Ala Glu Val Val Ala Ser Leu Val Pro Ala Ala
        955                 960                 965

tag                                                                2976
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<211> 991
<212> PRT
<213> Unknown

<220>
<221> SIGNAL
<222> (1)...(24)

<400> 27

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Leu Ser Ala Ser Leu Ala Ser Gly Thr Asp Phe Pro Val Arg Arg Thr
            -5                  1                   5
Asp Leu Gly Gln Val Gln Gly Leu Ala Gly Asp Val Met Ser Phe Arg
    10                  15                  20
Gly Ile Pro Tyr Ala Ala Pro Pro Val Gly Gly Leu Arg Trp Lys Pro
25                  30                  35                  40
Pro Gln His Ala Arg Pro Trp Ala Gly Val Arg Pro Ala Thr Gln Phe
                45                  50                  55
Gly Ser Asp Cys Phe Gly Ala Ala Tyr Leu Arg Lys Gly Ser Leu Ala
            60                  65                  70
Pro Gly Val Ser Glu Asp Cys Leu Tyr Leu Asn Val Trp Ala Pro Ser
        75                  80                  85
Gly Ala Lys Pro Gly Gln Tyr Pro Val Met Val Trp Val Tyr Gly Gly
    90                  95                  100
Gly Phe Ala Gly Gly Thr Ala Ala Met Pro Tyr Tyr Asp Gly Glu Ala
105                 110                 115                 120
Leu Ala Arg Gln Gly Val Val Val Val Thr Phe Asn Tyr Arg Thr Asn
                125                 130                 135
Ile Leu Gly Phe Phe Ala His Pro Gly Leu Ser Arg Glu Ser Pro Thr
            140                 145                 150
```

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Gly Thr Ser Gly Asn Tyr Gly Leu Leu Asp Ile Leu Ala Ala Leu Arg
        155                 160                 165
Trp Val Gln Ser Asn Ala Arg Ala Phe Gly Gly Asp Pro Gly Arg Val
    170                 175                 180
Thr Val Phe Gly Glu Ser Ala Gly Ala Ser Ala Ile Gly Leu Leu Leu
185                 190                 195                 200
Thr Ser Pro Leu Ser Lys Gly Leu Phe Arg Gly Ala Ile Leu Glu Ser
                205                 210                 215
Pro Gly Leu Thr Arg Pro Leu Ala Thr Leu Ala Asp Ser Ala Ala Ser
            220                 225                 230
Gly Glu Arg Leu Asp Ala Asp Leu Ser Arg Leu Arg Ser Thr Asp Pro
        235                 240                 245
Ala Thr Leu Met Ala Arg Ala Asp Ala Ala Arg Pro Ala Ser Arg Asp
    250                 255                 260
Leu Arg Arg Pro Arg Pro Thr Gly Pro Ile Val Asp Gly His Val Leu
265                 270                 275                 280
Pro Gln Thr Asp Ser Ala Ala Ile Ala Ala Gly Gln Leu Ala Pro Val
                285                 290                 295
Arg Val Leu Ile Gly Thr Asn Ala Asp Glu Gly Arg Ala Phe Leu Gly
            300                 305                 310
Arg Ala Pro Met Glu Thr Pro Ala Asp Tyr Gln Ala Tyr Leu Glu Ala
        315                 320                 325
Gln Phe Gly Asp Gln Ala Ala Ala Val Ala Ala Cys Tyr Pro Leu Asp
    330                 335                 340
Gly Arg Ala Thr Pro Lys Glu Met Val Ala Arg Ile Phe Gly Asp Asn
345                 350                 355                 360
Gln Phe Asn Arg Gly Val Ser Ala Phe Ser Glu Ala Leu Val Arg Gln
                365                 370                 375
Gly Ala Pro Val Trp Arg Tyr Gln Phe Asn Gly Asn Thr Glu Gly Gly
            380                 385                 390
Arg Ala Pro Ala Thr His Gly Ala Glu Ile Pro Tyr Val Phe Gly Val
        395                 400                 405
Phe Lys Leu Asp Glu Leu Gly Leu Phe Asp Trp Pro Pro Glu Gly Pro
    410                 415                 420
Thr Pro Ala Asp Arg Ala Leu Gly Gln Leu Met Ser Ser Ala Trp Val
425                 430                 435                 440
Arg Phe Ala Lys Asn Gly Asp Pro Ala Gly Asp Ala Leu Thr Trp Pro
                445                 450                 455
Ala Tyr Ser Thr Gly Lys Ser Thr Met Thr Phe Gly Pro Glu Gly Arg
            460                 465                 470
Ala Ala Val Val Ser Pro Gly Pro Ser Ile Pro Pro Cys Ala Asp Gly
        475                 480                 485
Ala Lys Ala Gly Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser
    490                 495                 500
Lys Asp Asn Val Ala Asp Val Val Val Val Gly Ala Gly Leu Ser Gly
505                 510                 515                 520
Leu Glu Thr Ala Arg Lys Val Gln Ala Ala Gly Leu Ser Cys Leu Val
                525                 530                 535
Leu Glu Ala Met Asp Arg Val Gly Gly Lys Thr Leu Ser Val Gln Ser
            540                 545                 550
Gly Pro Gly Arg Thr Thr Ile Asn Asp Leu Gly Ala Ala Trp Ile Asn
        555                 560                 565
Asp Ser Asn Gln Ser Glu Val Ser Arg Leu Phe Glu Arg Phe His Leu
    570                 575                 580
Glu Gly Glu Leu Gln Arg Thr Thr Gly Asn Ser Ile His Gln Ala Gln
585                 590                 595                 600
Asp Gly Thr Thr Thr Thr Ala Pro Tyr Gly Asp Ser Leu Leu Ser Glu
                605                 610                 615
Glu Val Ala Ser Ala Leu Ala Glu Leu Leu Pro Val Trp Ser Gln Leu
            620                 625                 630
Ile Glu Glu His Ser Leu Gln Asp Leu Lys Ala Ser Pro Gln Ala Lys
        635                 640                 645
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Arg Leu Asp Ser Val Ser Phe Ala His Tyr Cys Glu Lys Glu Leu Asn
    650                 655                 660
Leu Pro Ala Val Leu Gly Val Ala Asn Gln Ile Thr Arg Ala Leu Leu
665                 670                 675                 680
Gly Val Glu Ala His Glu Ile Ser Met Leu Phe Leu Thr Asp Tyr Ile
                685                 690                 695
Lys Ser Ala Thr Gly Leu Ser Asn Ile Phe Ser Asp Lys Lys Asp Gly
            700                 705                 710
Gly Gln Tyr Met Arg Cys Lys Thr Gly Met Gln Ser Ile Cys His Ala
        715                 720                 725
Met Ser Lys Glu Leu Val Pro Gly Ser Val His Leu Asn Thr Pro Val
    730                 735                 740
Ala Glu Ile Glu Gln Ser Ala Ser Gly Cys Thr Val Arg Ser Ala Ser
745                 750                 755                 760
Gly Ala Val Phe Arg Ser Lys Lys Val Val Val Ser Leu Pro Thr Thr
                765                 770                 775
Leu Tyr Pro Thr Leu Thr Phe Ser Pro Pro Leu Pro Ala Glu Lys Gln
            780                 785                 790
Ala Leu Ala Glu Asn Ser Ile Leu Gly Tyr Tyr Ser Lys Ile Val Phe
        795                 800                 805
Val Trp Asp Lys Pro Trp Trp Arg Glu Gln Gly Phe Ser Gly Val Leu
    810                 815                 820
Gln Ser Ser Cys Asp Pro Ile Ser Phe Ala Arg Asp Thr Ser Ile Asp
825                 830                 835                 840
Val Asp Arg Gln Trp Ser Ile Thr Cys Phe Met Val Gly Asp Pro Gly
                845                 850                 855
Arg Lys Trp Ser Gln Gln Ser Lys Gln Val Arg Gln Lys Ser Val Trp
            860                 865                 870
Asp Gln Leu Arg Ala Ala Tyr Glu Asn Ala Gly Ala Gln Val Pro Glu
        875                 880                 885
Pro Ala Asn Val Leu Glu Ile Glu Trp Ser Lys Gln Gln Tyr Phe Gln
    890                 895                 900
Gly Ala Pro Ser Ala Val Tyr Gly Leu Asn Asp Leu Ile Thr Leu Gly
905                 910                 915                 920
Ser Ala Leu Arg Thr Pro Phe Lys Ser Val His Phe Val Gly Thr Glu
                925                 930                 935
Thr Ser Leu Val Trp Lys Gly Tyr Met Glu Gly Ala Ile Arg Ser Gly
            940                 945                 950
Gln Arg Gly Ala Ala Glu Val Val Ala Ser Leu Val Pro Ala Ala
        955                 960                 965
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<210> 28
<211> 3618
<212> DNA
<213> Unknown

<220>
<223> gst:esp1:sp:K:trapao, 3618. 1-687, gst + polylinker; 688-2190, esp1 mat; 2191-2226 spacer; 2227-3615, K:trAPAO, extra lysine; 3616-3618, stop codon. For bacterial expression.

<221> CDS
<222> (1)...(3615)

<221> misc_feature
<222> (1)...(687)
<223> gast + polylinker

<221> mat_peptide
<222> (688)...(2190)
<223> esp1 mat

<221> misc_feature
<222> (2191)...(2226)
<223> spacer sequence

<221> misc_feature
<222> (2227)...(3615)
<223> K:trAPAO

<221> misc_feature
<222> (2227)...(2229)
<223> Extra lysine

<400> 28

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atg tcc cct ata cta ggt tat tgg aaa att aag ggc ctt gtg caa ccc      48
Met Ser Pro Ile Leu Gly Tyr Trp Lys Ile Lys Gly Leu Val Gln Pro
 1               5                  10                  15

act cga ctt ctt ttg gaa tat ctt gaa gaa aaa tat gaa gag cat ttg      96
Thr Arg Leu Leu Leu Glu Tyr Leu Glu Glu Lys Tyr Glu Glu His Leu
            20                  25                  30

tat gag cgc gat gaa ggt gat aaa tgg cga aac aaa aag ttt gaa ttg     144
Tyr Glu Arg Asp Glu Gly Asp Lys Trp Arg Asn Lys Lys Phe Glu Leu
        35                  40                  45

ggt ttg gag ttt ccc aat ctt cct tat tat att gat ggt gat gtt aaa     192
Gly Leu Glu Phe Pro Asn Leu Pro Tyr Tyr Ile Asp Gly Asp Val Lys
    50                  55                  60

tta aca cag tct atg gcc atc ata cgt tat ata gct gac aag cac aac     240
Leu Thr Gln Ser Met Ala Ile Ile Arg Tyr Ile Ala Asp Lys His Asn
65                  70                  75                  80

atg ttg ggt ggt tgt cca aaa gag cgt gca gag att tca atg ctt gaa     288
Met Leu Gly Gly Cys Pro Lys Glu Arg Ala Glu Ile Ser Met Leu Glu
                85                  90                  95

gga gcg gtt ttg gat att aga tac ggt gtt tcg aga att gca tat agt     336
Gly Ala Val Leu Asp Ile Arg Tyr Gly Val Ser Arg Ile Ala Tyr Ser
            100                 105                 110

aaa gac ttt gaa act ctc aaa gtt gat ttt ctt agc aag cta cct gaa     384
Lys Asp Phe Glu Thr Leu Lys Val Asp Phe Leu Ser Lys Leu Pro Glu
        115                 120                 125

atg ctg aaa atg ttc gaa gat cgt tta tgt cat aaa aca tat tta aat     432
Met Leu Lys Met Phe Glu Asp Arg Leu Cys His Lys Thr Tyr Leu Asn
    130                 135                 140

ggt gat cat gta acc cat cct gac ttc atg ttg tat gac gct ctt gat     480
Gly Asp His Val Thr His Pro Asp Phe Met Leu Tyr Asp Ala Leu Asp
145                 150                 155                 160

gtt gtt tta tac atg gac cca atg tgc ctg gat gcg ttc cca aaa tta     528
Val Val Leu Tyr Met Asp Pro Met Cys Leu Asp Ala Phe Pro Lys Leu
                165                 170                 175

gtt tgt ttt aaa aaa cgt att gaa gct atc cca caa att gat aag tac     576
Val Cys Phe Lys Lys Arg Ile Glu Ala Ile Pro Gln Ile Asp Lys Tyr
            180                 185                 190
```

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ttg aaa tcc agc aag tat ata gca tgg cct ttg cag ggc tgg caa gcc      624
Leu Lys Ser Ser Lys Tyr Ile Ala Trp Pro Leu Gln Gly Trp Gln Ala
        195                 200                 205

acg ttt ggt ggt ggc gac cat cct cca aaa tcg gat ctg gtt ccg cgt      672
Thr Phe Gly Gly Gly Asp His Pro Pro Lys Ser Asp Leu Val Pro Arg
    210                 215                 220

gga tcc ccg gaa ttc gct cct act gtc aag att gat gct ggg atg gtg      720
Gly Ser Pro Glu Phe Ala Pro Thr Val Lys Ile Asp Ala Gly Met Val
225                 230                 235                 240

gtc ggc acg act act act gtc ccc ggc acc act gcg acc gtc agc gag      768
Val Gly Thr Thr Thr Thr Val Pro Gly Thr Thr Ala Thr Val Ser Glu
                245                 250                 255

ttc ttg ggc gtt cct ttt gcc gcc tct ccg aca cga ttt gcg cct cct      816
Phe Leu Gly Val Pro Phe Ala Ala Ser Pro Thr Arg Phe Ala Pro Pro
            260                 265                 270

act cgt ccc gtg cct tgg tca acg cct ttg caa gcc act gca tat ggt      864
Thr Arg Pro Val Pro Trp Ser Thr Pro Leu Gln Ala Thr Ala Tyr Gly
        275                 280                 285

cca gca tgc cct caa caa ttc aat tac ccc gaa gaa ctc cgt gag att      912
Pro Ala Cys Pro Gln Gln Phe Asn Tyr Pro Glu Glu Leu Arg Glu Ile
    290                 295                 300

acg atg gcc tgg ttc aat aca ccg ccc ccg tca gct ggt gaa agt gag      960
Thr Met Ala Trp Phe Asn Thr Pro Pro Pro Ser Ala Gly Glu Ser Glu
305                 310                 315                 320

gac tgc ctg aac ctc aac atc tac gtc cca gga act gag aac aca aac     1008
Asp Cys Leu Asn Leu Asn Ile Tyr Val Pro Gly Thr Glu Asn Thr Asn
                325                 330                 335

aaa gcc gtc atg gtt tgg ata tac ggt gga gcg ctg gaa tat ggt tgg     1056
Lys Ala Val Met Val Trp Ile Tyr Gly Gly Ala Leu Glu Tyr Gly Trp
            340                 345                 350

aat tca ttc cac ctt tac gac ggg gct agt ttc gca gcc aat cag gat     1104
Asn Ser Phe His Leu Tyr Asp Gly Ala Ser Phe Ala Ala Asn Gln Asp
        355                 360                 365

gtc atc gcc gtg acc atc aac tac aga acg aac att ctg ggg ttc cct     1152
Val Ile Ala Val Thr Ile Asn Tyr Arg Thr Asn Ile Leu Gly Phe Pro
    370                 375                 380

gct gcc cct cag ctt cca ata aca cag cga aat ctg ggg ttc cta gac     1200
Ala Ala Pro Gln Leu Pro Ile Thr Gln Arg Asn Leu Gly Phe Leu Asp
385                 390                 395                 400

caa agg ttt gct ttg gat tgg gta cag cgg aac atc gca gcc ttt ggc     1248
Gln Arg Phe Ala Leu Asp Trp Val Gln Arg Asn Ile Ala Ala Phe Gly
                405                 410                 415

ggt gat cct cga aag gtc aca ata ttt ggg cag agt gcg ggg ggc aga     1296
Gly Asp Pro Arg Lys Val Thr Ile Phe Gly Gln Ser Ala Gly Gly Arg
            420                 425                 430

agt gtc gac gtc ctc ttg acg tct atg cca cac aac cca ccc ttc cga     1344
Ser Val Asp Val Leu Leu Thr Ser Met Pro His Asn Pro Pro Phe Arg
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        435                 440                 445

gca gca atc atg gag tcc ggt gtg gct aac tac aac ttc ccc aag gga      1392
Ala Ala Ile Met Glu Ser Gly Val Ala Asn Tyr Asn Phe Pro Lys Gly
    450                 455                 460

gat ttg tcc gaa cct tgg aac acc act gtt caa gct ctc aac tgt acc      1440
Asp Leu Ser Glu Pro Trp Asn Thr Thr Val Gln Ala Leu Asn Cys Thr
465                 470                 475                 480

acc agt atc gac atc ttg agt tgt atg aga aga gtc gat ctc gcc act      1488
Thr Ser Ile Asp Ile Leu Ser Cys Met Arg Arg Val Asp Leu Ala Thr
                485                 490                 495

ctg atg aac acg atc gag caa ctc gga ctt ggg ttt gag tac acg ttg      1536
Leu Met Asn Thr Ile Glu Gln Leu Gly Leu Gly Phe Glu Tyr Thr Leu
            500                 505                 510

gac aac gta acg gct gtg tac cgt tct gaa acg gct cgc acg act ggt      1584
Asp Asn Val Thr Ala Val Tyr Arg Ser Glu Thr Ala Arg Thr Thr Gly
        515                 520                 525

gac att gct cgt gta cct gtt ctc gtc ggg acg gtg gcc aac gac gga      1632
Asp Ile Ala Arg Val Pro Val Leu Val Gly Thr Val Ala Asn Asp Gly
    530                 535                 540

ctt ctc ttt gtc ctc ggg gag aat gac acc caa gca tat ctc gag gag      1680
Leu Leu Phe Val Leu Gly Glu Asn Asp Thr Gln Ala Tyr Leu Glu Glu
545                 550                 555                 560

gca atc ccg aat cag ccc gac ctt tac cag act ctc ctt gga gca tat      1728
Ala Ile Pro Asn Gln Pro Asp Leu Tyr Gln Thr Leu Leu Gly Ala Tyr
                565                 570                 575

ccc att gga tcc cca ggg atc gga tcg cct caa gat cag att gcc gcc      1776
Pro Ile Gly Ser Pro Gly Ile Gly Ser Pro Gln Asp Gln Ile Ala Ala
            580                 585                 590

att gag acc gag gta aga ttc cag tgt cct tct gcc atc gtg gct cag      1824
Ile Glu Thr Glu Val Arg Phe Gln Cys Pro Ser Ala Ile Val Ala Gln
        595                 600                 605

gac tcc cgg aat cgg ggt atc cct tct tgg cgc tac tac tac aat gcg      1872
Asp Ser Arg Asn Arg Gly Ile Pro Ser Trp Arg Tyr Tyr Tyr Asn Ala
    610                 615                 620

acc ttt gag aat ctg gag ctt ttc cct ggg tcc gaa gtg tac cac agc      1920
Thr Phe Glu Asn Leu Glu Leu Phe Pro Gly Ser Glu Val Tyr His Ser
625                 630                 635                 640

tct gaa gtc ggg atg gtg ttt ggc acg tat cct gtc gca agt gcg acc      1968
Ser Glu Val Gly Met Val Phe Gly Thr Tyr Pro Val Ala Ser Ala Thr
                645                 650                 655

gcc ttg gag gcc cag acg agc aaa tac atg cag ggt gcc tgg gcg gcc      2016
Ala Leu Glu Ala Gln Thr Ser Lys Tyr Met Gln Gly Ala Trp Ala Ala
            660                 665                 670

ttt gcc aaa aac ccc atg aat ggg cct ggg tgg aaa caa gtg ccg aat      2064
Phe Ala Lys Asn Pro Met Asn Gly Pro Gly Trp Lys Gln Val Pro Asn
        675                 680                 685
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gtc gcg gcg ctt ggc tca cca ggc aaa gcc atc cag gtt gac gtc tct     2112
Val Ala Ala Leu Gly Ser Pro Gly Lys Ala Ile Gln Val Asp Val Ser
    690                 695                 700

cca gcg aca ata gac caa cga tgt gcc ttg tac acg cgt tat tat act     2160
Pro Ala Thr Ile Asp Gln Arg Cys Ala Leu Tyr Thr Arg Tyr Tyr Thr
705                 710                 715                 720

gag ttg ggc aca atc gcg ccg agg aca ttt ggc gga ggc agc ggc gga     2208
Glu Leu Gly Thr Ile Ala Pro Arg Thr Phe Gly Gly Gly Ser Gly Gly
                725                 730                 735

ggc agc ggc gga ggc agc aaa gac aac gtt gcg gac gtg gta gtg gtg     2256
Gly Ser Gly Gly Gly Ser Lys Asp Asn Val Ala Asp Val Val Val Val
            740                 745                 750

ggc gct ggc ttg agc ggt ttg gag acg gca cgc aaa gtc cag gcc gcc     2304
Gly Ala Gly Leu Ser Gly Leu Glu Thr Ala Arg Lys Val Gln Ala Ala
        755                 760                 765

ggt ctg tcc tgc ctc gtt ctt gag gcg atg gat cgt gta ggg gga aag     2352
Gly Leu Ser Cys Leu Val Leu Glu Ala Met Asp Arg Val Gly Gly Lys
    770                 775                 780

act ctg agc gta caa tcg ggt ccc ggc agg acg act atc aac gac ctc     2400
Thr Leu Ser Val Gln Ser Gly Pro Gly Arg Thr Thr Ile Asn Asp Leu
785                 790                 795                 800

ggc gct gcg tgg atc aat gac agc aac caa agc gaa gta tcc aga ttg     2448
Gly Ala Ala Trp Ile Asn Asp Ser Asn Gln Ser Glu Val Ser Arg Leu
                805                 810                 815

ttt gaa aga ttt cat ttg gag ggc gag ctc cag agg acg act gga aat     2496
Phe Glu Arg Phe His Leu Glu Gly Glu Leu Gln Arg Thr Thr Gly Asn
            820                 825                 830

tca atc cat caa gca caa gac ggt aca acc act aca gct cct tat ggt     2544
Ser Ile His Gln Ala Gln Asp Gly Thr Thr Thr Thr Ala Pro Tyr Gly
        835                 840                 845

gac tcc ttg ctg agc gag gag gtt gca agt gca ctt gcg gaa ctc ctc     2592
Asp Ser Leu Leu Ser Glu Glu Val Ala Ser Ala Leu Ala Glu Leu Leu
    850                 855                 860

ccc gta tgg tct cag ctg atc gaa gag cat agc ctt caa gac ctc aag     2640
Pro Val Trp Ser Gln Leu Ile Glu Glu His Ser Leu Gln Asp Leu Lys
865                 870                 875                 880

gcg agc cct cag gcg aag cgg ctc gac agt gtg agc ttc gcg cac tac     2688
Ala Ser Pro Gln Ala Lys Arg Leu Asp Ser Val Ser Phe Ala His Tyr
                885                 890                 895

tgt gag aag gaa cta aac ttg cct gct gtt ctc ggc gta gca aac cag     2736
Cys Glu Lys Glu Leu Asn Leu Pro Ala Val Leu Gly Val Ala Asn Gln
            900                 905                 910

atc aca cgc gct ctg ctc ggt gtg gaa gcc cac gag atc agc atg ctt     2784
Ile Thr Arg Ala Leu Leu Gly Val Glu Ala His Glu Ile Ser Met Leu
        915                 920                 925

ttt ctc acc gac tac atc aag agt gcc acc ggt ctc agt aat att ttc     2832
Phe Leu Thr Asp Tyr Ile Lys Ser Ala Thr Gly Leu Ser Asn Ile Phe
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    930                 935                 940

tcg gac aag aaa gac ggc ggg cag tat atg cga tgc aaa aca ggt atg     2880
Ser Asp Lys Lys Asp Gly Gly Gln Tyr Met Arg Cys Lys Thr Gly Met
945                 950                 955                 960

cag tcg att tgc cat gcc atg tca aag gaa ctt gtt cca ggc tca gtg     2928
Gln Ser Ile Cys His Ala Met Ser Lys Glu Leu Val Pro Gly Ser Val
                965                 970                 975

cac ctc aac acc ccc gtc gct gaa att gag cag tcg gca tcc ggc tgt     2976
His Leu Asn Thr Pro Val Ala Glu Ile Glu Gln Ser Ala Ser Gly Cys
            980                 985                 990

aca gta cga tcg gcc tcg ggc gcc gtg ttc cga agc aaa aag gtg gtg     3024
Thr Val Arg Ser Ala Ser Gly Ala Val Phe Arg Ser Lys Lys Val Val
        995                 1000                1005

gtt tcg tta ccg aca acc ttg tat ccc acc ttg aca ttt tca cca cct     3072
Val Ser Leu Pro Thr Thr Leu Tyr Pro Thr Leu Thr Phe Ser Pro Pro
    1010                1015                1020

ctt ccc gcc gag aag caa gca ttg gcg gaa aat tct atc ctg ggc tac     3120
Leu Pro Ala Glu Lys Gln Ala Leu Ala Glu Asn Ser Ile Leu Gly Tyr
1025                1030                1035                1040

tat agc aag ata gtc ttc gta tgg gac aag ccg tgg tgg cgc gaa caa     3168
Tyr Ser Lys Ile Val Phe Val Trp Asp Lys Pro Trp Trp Arg Glu Gln
                1045                1050                1055

ggc ttc tcg ggc gtc ctc caa tcg agc tgt gac ccc atc tca ttt gcc     3216
Gly Phe Ser Gly Val Leu Gln Ser Ser Cys Asp Pro Ile Ser Phe Ala
            1060                1065                1070

aga gat acc agc atc gac gtc gat cga caa tgg tcc att acc tgt ttc     3264
Arg Asp Thr Ser Ile Asp Val Asp Arg Gln Trp Ser Ile Thr Cys Phe
        1075                1080                1085

atg gtc gga gac ccg gga cgg aag tgg tcc caa cag tcc aag cag gta     3312
Met Val Gly Asp Pro Gly Arg Lys Trp Ser Gln Gln Ser Lys Gln Val
    1090                1095                1100

cga caa aag tct gtc tgg gac caa ctc cgc gca gcc tac gag aac gcc     3360
Arg Gln Lys Ser Val Trp Asp Gln Leu Arg Ala Ala Tyr Glu Asn Ala
1105                1110                1115                1120

ggg gcc caa gtc cca gag ccg gcc aac gtg ctc gaa atc gag tgg tcg     3408
Gly Ala Gln Val Pro Glu Pro Ala Asn Val Leu Glu Ile Glu Trp Ser
                1125                1130                1135

aag cag cag tat ttc caa gga gct ccg agc gcc gtc tat ggg ctg aac     3456
Lys Gln Gln Tyr Phe Gln Gly Ala Pro Ser Ala Val Tyr Gly Leu Asn
            1140                1145                1150

gat ctc atc aca ctg ggt tcg gcg ctc aga acg ccg ttc aag agt gtt     3504
Asp Leu Ile Thr Leu Gly Ser Ala Leu Arg Thr Pro Phe Lys Ser Val
        1155                1160                1165

cat ttc gtt gga acg gag acg tct tta gtt tgg aaa ggg tat atg gaa     3552
His Phe Val Gly Thr Glu Thr Ser Leu Val Trp Lys Gly Tyr Met Glu
    1170                1175                1180
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ggg gcc ata cga tcg ggt caa cga ggt gct gca gaa gtt gtg gct agc     3600
Gly Ala Ile Arg Ser Gly Gln Arg Gly Ala Ala Glu Val Val Ala Ser
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ctg gtg cca gca gca tag                                           3618
Leu Val Pro Ala Ala
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            20                  25                  30
Tyr Glu Arg Asp Glu Gly Asp Lys Trp Arg Asn Lys Lys Phe Glu Leu
        35                  40                  45
Gly Leu Glu Phe Pro Asn Leu Pro Tyr Tyr Ile Asp Gly Asp Val Lys
    50                  55                  60
Leu Thr Gln Ser Met Ala Ile Ile Arg Tyr Ile Ala Asp Lys His Asn
65                  70                  75                  80
Met Leu Gly Gly Cys Pro Lys Glu Arg Ala Glu Ile Ser Met Leu Glu
                85                  90                  95
Gly Ala Val Leu Asp Ile Arg Tyr Gly Val Ser Arg Ile Ala Tyr Ser
            100                 105                 110
Lys Asp Phe Glu Thr Leu Lys Val Asp Phe Leu Ser Lys Leu Pro Glu
        115                 120                 125
Met Leu Lys Met Phe Glu Asp Arg Leu Cys His Lys Thr Tyr Leu Asn
    130                 135                 140
Gly Asp His Val Thr His Pro Asp Phe Met Leu Tyr Asp Ala Leu Asp
145                 150                 155                 160
Val Val Leu Tyr Met Asp Pro Met Cys Leu Asp Ala Phe Pro Lys Leu
                165                 170                 175
Val Cys Phe Lys Lys Arg Ile Glu Ala Ile Pro Gln Ile Asp Lys Tyr
            180                 185                 190
Leu Lys Ser Ser Lys Tyr Ile Ala Trp Pro Leu Gln Gly Trp Gln Ala
        195                 200                 205
Thr Phe Gly Gly Gly Asp His Pro Pro Lys Ser Asp Leu Val Pro Arg
    210                 215                 220
Gly Ser Pro Glu Phe Ala Pro Thr Val Lys Ile Asp Ala Gly Met Val
225                 230                 235                 240
Val Gly Thr Thr Thr Thr Val Pro Gly Thr Thr Ala Thr Val Ser Glu
                245                 250                 255
Phe Leu Gly Val Pro Phe Ala Ala Ser Pro Thr Arg Phe Ala Pro Pro
            260                 265                 270
Thr Arg Pro Val Pro Trp Ser Thr Pro Leu Gln Ala Thr Ala Tyr Gly
        275                 280                 285
Pro Ala Cys Pro Gln Gln Phe Asn Tyr Pro Glu Glu Leu Arg Glu Ile
    290                 295                 300
Thr Met Ala Trp Phe Asn Thr Pro Pro Pro Ser Ala Gly Glu Ser Glu
305                 310                 315                 320
Asp Cys Leu Asn Leu Asn Ile Tyr Val Pro Gly Thr Glu Asn Thr Asn
                325                 330                 335
Lys Ala Val Met Val Trp Ile Tyr Gly Gly Ala Leu Glu Tyr Gly Trp
            340                 345                 350
Asn Ser Phe His Leu Tyr Asp Gly Ala Ser Phe Ala Ala Asn Gln Asp
        355                 360                 365
Val Ile Ala Val Thr Ile Asn Tyr Arg Thr Asn Ile Leu Gly Phe Pro
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    370                 375                 380
Ala Ala Pro Gln Leu Pro Ile Thr Gln Arg Asn Leu Gly Phe Leu Asp
385                 390                 395                 400
Gln Arg Phe Ala Leu Asp Trp Val Gln Arg Asn Ile Ala Ala Phe Gly
                405                 410                 415
Gly Asp Pro Arg Lys Val Thr Ile Phe Gly Gln Ser Ala Gly Gly Arg
            420                 425                 430
Ser Val Asp Val Leu Leu Thr Ser Met Pro His Asn Pro Pro Phe Arg
        435                 440                 445
Ala Ala Ile Met Glu Ser Gly Val Ala Asn Tyr Asn Phe Pro Lys Gly
    450                 455                 460
Asp Leu Ser Glu Pro Trp Asn Thr Thr Val Gln Ala Leu Asn Cys Thr
465                 470                 475                 480
Thr Ser Ile Asp Ile Leu Ser Cys Met Arg Arg Val Asp Leu Ala Thr
                485                 490                 495
Leu Met Asn Thr Ile Glu Gln Leu Gly Leu Gly Phe Glu Tyr Thr Leu
            500                 505                 510
Asp Asn Val Thr Ala Val Tyr Arg Ser Glu Thr Ala Arg Thr Thr Gly
        515                 520                 525
Asp Ile Ala Arg Val Pro Val Leu Val Gly Thr Val Ala Asn Asp Gly
    530                 535                 540
Leu Leu Phe Val Leu Gly Glu Asn Asp Thr Gln Ala Tyr Leu Glu Glu
545                 550                 555                 560
Ala Ile Pro Asn Gln Pro Asp Leu Tyr Gln Thr Leu Leu Gly Ala Tyr
                565                 570                 575
Pro Ile Gly Ser Pro Gly Ile Gly Ser Pro Gln Asp Gln Ile Ala Ala
            580                 585                 590
Ile Glu Thr Glu Val Arg Phe Gln Cys Pro Ser Ala Ile Val Ala Gln
        595                 600                 605
Asp Ser Arg Asn Arg Gly Ile Pro Ser Trp Arg Tyr Tyr Tyr Asn Ala
    610                 615                 620
Thr Phe Glu Asn Leu Glu Leu Phe Pro Gly Ser Glu Val Tyr His Ser
625                 630                 635                 640
Ser Glu Val Gly Met Val Phe Gly Thr Tyr Pro Val Ala Ser Ala Thr
                645                 650                 655
Ala Leu Glu Ala Gln Thr Ser Lys Tyr Met Gln Gly Ala Trp Ala Ala
            660                 665                 670
Phe Ala Lys Asn Pro Met Asn Gly Pro Gly Trp Lys Gln Val Pro Asn
        675                 680                 685
Val Ala Ala Leu Gly Ser Pro Gly Lys Ala Ile Gln Val Asp Val Ser
    690                 695                 700
Pro Ala Thr Ile Asp Gln Arg Cys Ala Leu Tyr Thr Arg Tyr Tyr Thr
705                 710                 715                 720
Glu Leu Gly Thr Ile Ala Pro Arg Thr Phe Gly Gly Gly Ser Gly Gly
                725                 730                 735
Gly Ser Gly Gly Gly Ser Lys Asp Asn Val Ala Asp Val Val Val Val
            740                 745                 750
Gly Ala Gly Leu Ser Gly Leu Glu Thr Ala Arg Lys Val Gln Ala Ala
        755                 760                 765
Gly Leu Ser Cys Leu Val Leu Glu Ala Met Asp Arg Val Gly Gly Lys
    770                 775                 780
Thr Leu Ser Val Gln Ser Gly Pro Gly Arg Thr Thr Ile Asn Asp Leu
785                 790                 795                 800
Gly Ala Ala Trp Ile Asn Asp Ser Asn Gln Ser Glu Val Ser Arg Leu
                805                 810                 815
Phe Glu Arg Phe His Leu Glu Gly Glu Leu Gln Arg Thr Thr Gly Asn
            820                 825                 830
Ser Ile His Gln Ala Gln Asp Gly Thr Thr Thr Thr Ala Pro Tyr Gly
        835                 840                 845
Asp Ser Leu Leu Ser Glu Glu Val Ala Ser Ala Leu Ala Glu Leu Leu
    850                 855                 860
Pro Val Trp Ser Gln Leu Ile Glu Glu His Ser Leu Gln Asp Leu Lys
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865                 870                 875                 880
Ala Ser Pro Gln Ala Lys Arg Leu Asp Ser Val Ser Phe Ala His Tyr
                885                 890                 895
Cys Glu Lys Glu Leu Asn Leu Pro Ala Val Leu Gly Val Ala Asn Gln
            900                 905                 910
Ile Thr Arg Ala Leu Leu Gly Val Glu Ala His Glu Ile Ser Met Leu
        915                 920                 925
Phe Leu Thr Asp Tyr Ile Lys Ser Ala Thr Gly Leu Ser Asn Ile Phe
    930                 935                 940
Ser Asp Lys Lys Asp Gly Gly Gln Tyr Met Arg Cys Lys Thr Gly Met
945                 950                 955                 960
Gln Ser Ile Cys His Ala Met Ser Lys Glu Leu Val Pro Gly Ser Val
                965                 970                 975
His Leu Asn Thr Pro Val Ala Glu Ile Glu Gln Ser Ala Ser Gly Cys
            980                 985                 990
Thr Val Arg Ser Ala Ser Gly Ala Val Phe Arg Ser Lys Lys Val Val
        995                 1000                1005
Val Ser Leu Pro Thr Thr Leu Tyr Pro Thr Leu Thr Phe Ser Pro Pro
    1010                1015                1020
Leu Pro Ala Glu Lys Gln Ala Leu Ala Glu Asn Ser Ile Leu Gly Tyr
1025                1030                1035                1040
Tyr Ser Lys Ile Val Phe Val Trp Asp Lys Pro Trp Trp Arg Glu Gln
                1045                1050                1055
Gly Phe Ser Gly Val Leu Gln Ser Ser Cys Asp Pro Ile Ser Phe Ala
            1060                1065                1070
Arg Asp Thr Ser Ile Asp Val Asp Arg Gln Trp Ser Ile Thr Cys Phe
        1075                1080                1085
Met Val Gly Asp Pro Gly Arg Lys Trp Ser Gln Gln Ser Lys Gln Val
    1090                1095                1100
Arg Gln Lys Ser Val Trp Asp Gln Leu Arg Ala Ala Tyr Glu Asn Ala
1105                1110                1115                1120
Gly Ala Gln Val Pro Glu Pro Ala Asn Val Leu Glu Ile Glu Trp Ser
                1125                1130                1135
Lys Gln Gln Tyr Phe Gln Gly Ala Pro Ser Ala Val Tyr Gly Leu Asn
            1140                1145                1150
Asp Leu Ile Thr Leu Gly Ser Ala Leu Arg Thr Pro Phe Lys Ser Val
        1155                1160                1165
His Phe Val Gly Thr Glu Thr Ser Leu Val Trp Lys Gly Tyr Met Glu
    1170                1175                1180
Gly Ala Ile Arg Ser Gly Gln Arg Gly Ala Ala Glu Val Val Ala Ser
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Leu Val Pro Ala Ala
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<212> DNA
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gst:BEST1:sp:K:trAPAO fusion, 3591 nt. 1-687 gst + polylinker, 688-2163, BEST1 mature; 2164-2199, spacer, 2200-3588, K:trAPAO

<221> misc_feature
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<221> mat_peptide

09/30/2005 15:49:05

<222> (688)...(2163)
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<223> Extra lysine

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 1               5                  10                  15

act cga ctt ctt ttg gaa tat ctt gaa gaa aaa tat gaa gag cat ttg       96
Thr Arg Leu Leu Leu Glu Tyr Leu Glu Glu Lys Tyr Glu Glu His Leu
            20                  25                  30

tat gag cgc gat gaa ggt gat aaa tgg cga aac aaa aag ttt gaa ttg      144
Tyr Glu Arg Asp Glu Gly Asp Lys Trp Arg Asn Lys Lys Phe Glu Leu
        35                  40                  45

ggt ttg gag ttt ccc aat ctt cct tat tat att gat ggt gat gtt aaa      192
Gly Leu Glu Phe Pro Asn Leu Pro Tyr Tyr Ile Asp Gly Asp Val Lys
    50                  55                  60

tta aca cag tct atg gcc atc ata cgt tat ata gct gac aag cac aac      240
Leu Thr Gln Ser Met Ala Ile Ile Arg Tyr Ile Ala Asp Lys His Asn
65                  70                  75                  80

atg ttg ggt ggt tgt cca aaa gag cgt gca gag att tca atg ctt gaa      288
Met Leu Gly Gly Cys Pro Lys Glu Arg Ala Glu Ile Ser Met Leu Glu
                85                  90                  95

gga gcg gtt ttg gat att aga tac ggt gtt tcg aga att gca tat agt      336
Gly Ala Val Leu Asp Ile Arg Tyr Gly Val Ser Arg Ile Ala Tyr Ser
            100                 105                 110

aaa gac ttt gaa act ctc aaa gtt gat ttt ctt agc aag cta cct gaa      384
Lys Asp Phe Glu Thr Leu Lys Val Asp Phe Leu Ser Lys Leu Pro Glu
        115                 120                 125

atg ctg aaa atg ttc gaa gat cgt tta tgt cat aaa aca tat tta aat      432
Met Leu Lys Met Phe Glu Asp Arg Leu Cys His Lys Thr Tyr Leu Asn
    130                 135                 140

ggt gat cat gta acc cat cct gac ttc atg ttg tat gac gct ctt gat      480
Gly Asp His Val Thr His Pro Asp Phe Met Leu Tyr Asp Ala Leu Asp
145                 150                 155                 160

gtt gtt tta tac atg gac cca atg tgc ctg gat gcg ttc cca aaa tta      528
Val Val Leu Tyr Met Asp Pro Met Cys Leu Asp Ala Phe Pro Lys Leu
                165                 170                 175
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gtt tgt ttt aaa aaa cgt att gaa gct atc cca caa att gat aag tac      576
Val Cys Phe Lys Lys Arg Ile Glu Ala Ile Pro Gln Ile Asp Lys Tyr
            180                 185                 190

ttg aaa tcc agc aag tat ata gca tgg cct ttg cag ggc tgg caa gcc      624
Leu Lys Ser Ser Lys Tyr Ile Ala Trp Pro Leu Gln Gly Trp Gln Ala
        195                 200                 205

acg ttt ggt ggt ggc gac cat cct cca aaa tcg gat ctg gtt ccg cgt      672
Thr Phe Gly Gly Gly Asp His Pro Pro Lys Ser Asp Leu Val Pro Arg
    210                 215                 220

gga tcc ccg gaa ttc acg gat ttt ccg gtc cgc agg acc gat ctg ggc      720
Gly Ser Pro Glu Phe Thr Asp Phe Pro Val Arg Arg Thr Asp Leu Gly
225                 230                 235                 240

cag gtt cag gga ctg gcc ggg gac gtg atg agc ttt cgc gga ata ccc      768
Gln Val Gln Gly Leu Ala Gly Asp Val Met Ser Phe Arg Gly Ile Pro
                245                 250                 255

tat gca gcg ccg ccg gtg ggc ggg ctg cgt tgg aag ccg ccc caa cac      816
Tyr Ala Ala Pro Pro Val Gly Gly Leu Arg Trp Lys Pro Pro Gln His
            260                 265                 270

gcc cgg ccc tgg gcg ggc gtt cgc ccc gcc acc caa ttt ggc tcc gac      864
Ala Arg Pro Trp Ala Gly Val Arg Pro Ala Thr Gln Phe Gly Ser Asp
        275                 280                 285

tgc ttc ggc gcg gcc tat ctt cgc aaa ggc agc ctc gcc ccc ggc gtg      912
Cys Phe Gly Ala Ala Tyr Leu Arg Lys Gly Ser Leu Ala Pro Gly Val
    290                 295                 300

agc gag gac tgt ctt tac ctc aac gta tgg gcg ccg tca ggc gct aaa      960
Ser Glu Asp Cys Leu Tyr Leu Asn Val Trp Ala Pro Ser Gly Ala Lys
305                 310                 315                 320

ccc ggc cag tac ccc gtc atg gtc tgg gtc tac ggc ggc ggc ttc gcc     1008
Pro Gly Gln Tyr Pro Val Met Val Trp Val Tyr Gly Gly Gly Phe Ala
                325                 330                 335

ggc ggc acg gcc gcc atg ccc tac tac gac ggc gag gcg ctt gcg cga     1056
Gly Gly Thr Ala Ala Met Pro Tyr Tyr Asp Gly Glu Ala Leu Ala Arg
            340                 345                 350

cag ggc gtc gtc gtg gtg acg ttt aac tat cgg acg aac atc ctg ggc     1104
Gln Gly Val Val Val Val Thr Phe Asn Tyr Arg Thr Asn Ile Leu Gly
        355                 360                 365

ttt ttc gcc cat cct ggt ctc tcg cgc gag agc ccc acc gga act tcg     1152
Phe Phe Ala His Pro Gly Leu Ser Arg Glu Ser Pro Thr Gly Thr Ser
    370                 375                 380

ggc aac tac ggc cta ctc gac att ctc gcc gct ctt cgg tgg gtg cag     1200
Gly Asn Tyr Gly Leu Leu Asp Ile Leu Ala Ala Leu Arg Trp Val Gln
385                 390                 395                 400

agc aac gcc cgc gcc ttc gga ggg gac ccc ggc cga gtg acg gtc ttt     1248
Ser Asn Ala Arg Ala Phe Gly Gly Asp Pro Gly Arg Val Thr Val Phe
                405                 410                 415

ggt gaa tcg gcc gga gcg agc gcg atc gga ctt ctg ctc acc tcg ccg     1296
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Gly Glu Ser Ala Gly Ala Ser Ala Ile Gly Leu Leu Leu Thr Ser Pro
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ctg agc aag ggt ctc ttc cgt ggc gct atc ctc gaa agt cca ggg ctg     1344
Leu Ser Lys Gly Leu Phe Arg Gly Ala Ile Leu Glu Ser Pro Gly Leu
        435                 440                 445

acg cga ccg ctc gcg acg ctc gcc gac agc gcc gcc tcg ggc gag cgc     1392
Thr Arg Pro Leu Ala Thr Leu Ala Asp Ser Ala Ala Ser Gly Glu Arg
    450                 455                 460

ctc gac gcc gat ctt tcg cga ctg cgc tcg acc gac cca gcc acc ctg     1440
Leu Asp Ala Asp Leu Ser Arg Leu Arg Ser Thr Asp Pro Ala Thr Leu
465                 470                 475                 480

atg gcg cgc gcc gac gcg gcc cgc ccg gca tcg cgg gac ctg cgc agg     1488
Met Ala Arg Ala Asp Ala Ala Arg Pro Ala Ser Arg Asp Leu Arg Arg
                485                 490                 495

ccg cgt ccg acc gga ccg atc gtc gat ggc cat gtg ctg ccg cag acc     1536
Pro Arg Pro Thr Gly Pro Ile Val Asp Gly His Val Leu Pro Gln Thr
            500                 505                 510

gac agc gcg gcg atc gcg gcg ggg cag ctg gcg ccg gtt cgg gtc ctg     1584
Asp Ser Ala Ala Ile Ala Ala Gly Gln Leu Ala Pro Val Arg Val Leu
        515                 520                 525

atc gga acc aat gcc gac gaa ggc cgc gcc ttc ctc ggg cgc gcg ccg     1632
Ile Gly Thr Asn Ala Asp Glu Gly Arg Ala Phe Leu Gly Arg Ala Pro
    530                 535                 540

atg gag acg cca gcg gac tac caa gcc tat ctg gag gcg cag ttt ggc     1680
Met Glu Thr Pro Ala Asp Tyr Gln Ala Tyr Leu Glu Ala Gln Phe Gly
545                 550                 555                 560

gac caa gcc gcc gcc gtg gcg gcg tgc tat ccc ctc gac ggc cgg gcc     1728
Asp Gln Ala Ala Ala Val Ala Ala Cys Tyr Pro Leu Asp Gly Arg Ala
                565                 570                 575

acg ccc aag gaa atg gtc gcg cgc atc ttc ggc gac aat cag ttc aat     1776
Thr Pro Lys Glu Met Val Ala Arg Ile Phe Gly Asp Asn Gln Phe Asn
            580                 585                 590

cgg ggg gtc tcg gcc ttc tcg gaa gcg ctt gtg cgc cag ggc gcg ccc     1824
Arg Gly Val Ser Ala Phe Ser Glu Ala Leu Val Arg Gln Gly Ala Pro
        595                 600                 605

gtg tgg cgt tat cag ttc aac ggt aat acc gag ggt gga aga gcg ccg     1872
Val Trp Arg Tyr Gln Phe Asn Gly Asn Thr Glu Gly Gly Arg Ala Pro
    610                 615                 620

gct acc cac gga gcc gaa att ccc tac gtt ttc ggg gtg ttc aag ctc     1920
Ala Thr His Gly Ala Glu Ile Pro Tyr Val Phe Gly Val Phe Lys Leu
625                 630                 635                 640

gac gag ttg ggt ctg ttc gat tgg ccg ccc gag ggg ccc acg ccc gcc     1968
Asp Glu Leu Gly Leu Phe Asp Trp Pro Pro Glu Gly Pro Thr Pro Ala
                645                 650                 655

gac cgt gcg ctg ggc caa ctg atg tcc tcc gcc tgg gtc cgg ttc gcc     2016
Asp Arg Ala Leu Gly Gln Leu Met Ser Ser Ala Trp Val Arg Phe Ala
            660                 665                 670
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```
aag aat ggc gac ccc gcc ggg gac gcc ctt acc tgg cct gcc tat tct     2064
Lys Asn Gly Asp Pro Ala Gly Asp Ala Leu Thr Trp Pro Ala Tyr Ser
        675                 680                 685

acg ggc aag tcg acc atg aca ttc ggt ccc gag ggc cgc gcg gcg gtg     2112
Thr Gly Lys Ser Thr Met Thr Phe Gly Pro Glu Gly Arg Ala Ala Val
    690                 695                 700

gtg tcg ccc gga cct tcc atc ccc cct tgc gcg gat ggc gcc aag gcg     2160
Val Ser Pro Gly Pro Ser Ile Pro Pro Cys Ala Asp Gly Ala Lys Ala
705                 710                 715                 720

ggg ggc gga ggc agc ggc gga ggc agc ggc gga ggc agc aaa gac aac     2208
Gly Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Lys Asp Asn
                725                 730                 735

gtt gcg gac gtg gta gtg gtg ggc gct ggc ttg agc ggt ttg gag acg     2256
Val Ala Asp Val Val Val Val Gly Ala Gly Leu Ser Gly Leu Glu Thr
            740                 745                 750

gca cgc aaa gtc cag gcc gcc ggt ctg tcc tgc ctc gtt ctt gag gcg     2304
Ala Arg Lys Val Gln Ala Ala Gly Leu Ser Cys Leu Val Leu Glu Ala
        755                 760                 765

atg gat cgt gta ggg gga aag act ctg agc gta caa tcg ggt ccc ggc     2352
Met Asp Arg Val Gly Gly Lys Thr Leu Ser Val Gln Ser Gly Pro Gly
    770                 775                 780

agg acg act atc aac gac ctc ggc gct gcg tgg atc aat gac agc aac     2400
Arg Thr Thr Ile Asn Asp Leu Gly Ala Ala Trp Ile Asn Asp Ser Asn
785                 790                 795                 800

caa agc gaa gta tcc aga ttg ttt gaa aga ttt cat ttg gag ggc gag     2448
Gln Ser Glu Val Ser Arg Leu Phe Glu Arg Phe His Leu Glu Gly Glu
                805                 810                 815

ctc cag agg acg act gga aat tca atc cat caa gca caa gac ggt aca     2496
Leu Gln Arg Thr Thr Gly Asn Ser Ile His Gln Ala Gln Asp Gly Thr
            820                 825                 830

acc act aca gct cct tat ggt gac tcc ttg ctg agc gag gag gtt gca     2544
Thr Thr Thr Ala Pro Tyr Gly Asp Ser Leu Leu Ser Glu Glu Val Ala
        835                 840                 845

agt gca ctt gcg gaa ctc ctc ccc gta tgg tct cag ctg atc gaa gag     2592
Ser Ala Leu Ala Glu Leu Leu Pro Val Trp Ser Gln Leu Ile Glu Glu
    850                 855                 860

cat agc ctt caa gac ctc aag gcg agc cct cag gcg aag cgg ctc gac     2640
His Ser Leu Gln Asp Leu Lys Ala Ser Pro Gln Ala Lys Arg Leu Asp
865                 870                 875                 880

agt gtg agc ttc gcg cac tac tgt gag aag gaa cta aac ttg cct gct     2688
Ser Val Ser Phe Ala His Tyr Cys Glu Lys Glu Leu Asn Leu Pro Ala
                885                 890                 895

gtt ctc ggc gta gca aac cag atc aca cgc gct ctg ctc ggt gtg gaa     2736
Val Leu Gly Val Ala Asn Gln Ile Thr Arg Ala Leu Leu Gly Val Glu
            900                 905                 910

gcc cac gag atc agc atg ctt ttt ctc acc gac tac atc aag agt gcc     2784
```

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Ala His Glu Ile Ser Met Leu Phe Leu Thr Asp Tyr Ile Lys Ser Ala
        915                 920                 925

acc ggt ctc agt aat att ttc tcg gac aag aaa gac ggc ggg cag tat     2832
Thr Gly Leu Ser Asn Ile Phe Ser Asp Lys Lys Asp Gly Gly Gln Tyr
    930                 935                 940

atg cga tgc aaa aca ggt atg cag tcg att tgc cat gcc atg tca aag     2880
Met Arg Cys Lys Thr Gly Met Gln Ser Ile Cys His Ala Met Ser Lys
945                 950                 955                 960

gaa ctt gtt cca ggc tca gtg cac ctc aac acc ccc gtc gct gaa att     2928
Glu Leu Val Pro Gly Ser Val His Leu Asn Thr Pro Val Ala Glu Ile
                965                 970                 975

gag cag tcg gca tcc ggc tgt aca gta cga tcg gcc tcg ggc gcc gtg     2976
Glu Gln Ser Ala Ser Gly Cys Thr Val Arg Ser Ala Ser Gly Ala Val
            980                 985                 990

ttc cga agc aaa aag gtg gtg gtt tcg tta ccg aca acc ttg tat ccc     3024
Phe Arg Ser Lys Lys Val Val Val Ser Leu Pro Thr Thr Leu Tyr Pro
        995                 1000                1005

acc ttg aca ttt tca cca cct ctt ccc gcc gag aag caa gca ttg gcg     3072
Thr Leu Thr Phe Ser Pro Pro Leu Pro Ala Glu Lys Gln Ala Leu Ala
    1010                1015                1020

gaa aat tct atc ctg ggc tac tat agc aag ata gtc ttc gta tgg gac     3120
Glu Asn Ser Ile Leu Gly Tyr Tyr Ser Lys Ile Val Phe Val Trp Asp
1025                1030                1035                1040

aag ccg tgg tgg cgc gaa caa ggc ttc tcg ggc gtc ctc caa tcg agc     3168
Lys Pro Trp Trp Arg Glu Gln Gly Phe Ser Gly Val Leu Gln Ser Ser
                1045                1050                1055

tgt gac ccc atc tca ttt gcc aga gat acc agc atc gac gtc gat cga     3216
Cys Asp Pro Ile Ser Phe Ala Arg Asp Thr Ser Ile Asp Val Asp Arg
            1060                1065                1070

caa tgg tcc att acc tgt ttc atg gtc gga gac ccg gga cgg aag tgg     3264
Gln Trp Ser Ile Thr Cys Phe Met Val Gly Asp Pro Gly Arg Lys Trp
        1075                1080                1085

tcc caa cag tcc aag cag gta cga caa aag tct gtc tgg gac caa ctc     3312
Ser Gln Gln Ser Lys Gln Val Arg Gln Lys Ser Val Trp Asp Gln Leu
    1090                1095                1100

cgc gca gcc tac gag aac gcc ggg gcc caa gtc cca gag ccg gcc aac     3360
Arg Ala Ala Tyr Glu Asn Ala Gly Ala Gln Val Pro Glu Pro Ala Asn
1105                1110                1115                1120

gtg ctc gaa atc gag tgg tcg aag cag cag tat ttc caa gga gct ccg     3408
Val Leu Glu Ile Glu Trp Ser Lys Gln Gln Tyr Phe Gln Gly Ala Pro
                1125                1130                1135

agc gcc gtc tat ggg ctg aac gat ctc atc aca ctg ggt tcg gcg ctc     3456
Ser Ala Val Tyr Gly Leu Asn Asp Leu Ile Thr Leu Gly Ser Ala Leu
            1140                1145                1150

aga acg ccg ttc aag agt gtt cat ttc gtt gga acg gag acg tct tta     3504
Arg Thr Pro Phe Lys Ser Val His Phe Val Gly Thr Glu Thr Ser Leu
        1155                1160                1165
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Amended Sheet - IPEA/US

```
gtt tgg aaa ggg tat atg gaa ggg gcc ata cga tcg ggt caa cga ggt     3552
Val Trp Lys Gly Tyr Met Glu Gly Ala Ile Arg Ser Gly Gln Arg Gly
    1170                1175                1180

gct gca gaa gtt gtg gct agc ctg gtg cca gca gca tag                3591
Ala Ala Glu Val Val Ala Ser Leu Val Pro Ala Ala
1185                1190                1195


      <210> 31
      <211> 1196
      <212> PRT
      <213> Unknown

      <400> 31
Met Ser Pro Ile Leu Gly Tyr Trp Lys Ile Lys Gly Leu Val Gln Pro
 1               5                  10                  15
Thr Arg Leu Leu Leu Glu Tyr Leu Glu Glu Lys Tyr Glu Glu His Leu
            20                  25                  30
Tyr Glu Arg Asp Glu Gly Asp Lys Trp Arg Asn Lys Lys Phe Glu Leu
        35                  40                  45
Gly Leu Glu Phe Pro Asn Leu Pro Tyr Tyr Ile Asp Gly Asp Val Lys

    50                  55                  60
Leu Thr Gln Ser Met Ala Ile Ile Arg Tyr Ile Ala Asp Lys His Asn
65                  70                  75                  80
Met Leu Gly Gly Cys Pro Lys Glu Arg Ala Glu Ile Ser Met Leu Glu
                85                  90                  95
Gly Ala Val Leu Asp Ile Arg Tyr Gly Val Ser Arg Ile Ala Tyr Ser
            100                 105                 110
Lys Asp Phe Glu Thr Leu Lys Val Asp Phe Leu Ser Lys Leu Pro Glu
        115                 120                 125
Met Leu Lys Met Phe Glu Asp Arg Leu Cys His Lys Thr Tyr Leu Asn
    130                 135                 140
Gly Asp His Val Thr His Pro Asp Phe Met Leu Tyr Asp Ala Leu Asp
145                 150                 155                 160
Val Val Leu Tyr Met Asp Pro Met Cys Leu Asp Ala Phe Pro Lys Leu
                165                 170                 175
Val Cys Phe Lys Lys Arg Ile Glu Ala Ile Pro Gln Ile Asp Lys Tyr
            180                 185                 190
Leu Lys Ser Ser Lys Tyr Ile Ala Trp Pro Leu Gln Gly Trp Gln Ala
        195                 200                 205
Thr Phe Gly Gly Gly Asp His Pro Pro Lys Ser Asp Leu Val Pro Arg
    210                 215                 220
Gly Ser Pro Glu Phe Thr Asp Phe Pro Val Arg Arg Thr Asp Leu Gly
225                 230                 235                 240
Gln Val Gln Gly Leu Ala Gly Asp Val Met Ser Phe Arg Gly Ile Pro
                245                 250                 255
Tyr Ala Ala Pro Pro Val Gly Gly Leu Arg Trp Lys Pro Pro Gln His
            260                 265                 270
Ala Arg Pro Trp Ala Gly Val Arg Pro Ala Thr Gln Phe Gly Ser Asp
        275                 280                 285
Cys Phe Gly Ala Ala Tyr Leu Arg Lys Gly Ser Leu Ala Pro Gly Val
    290                 295                 300
Ser Glu Asp Cys Leu Tyr Leu Asn Val Trp Ala Pro Ser Gly Ala Lys
305                 310                 315                 320
Pro Gly Gln Tyr Pro Val Met Val Trp Val Tyr Gly Gly Gly Phe Ala
                325                 330                 335
Gly Gly Thr Ala Ala Met Pro Tyr Tyr Asp Gly Glu Ala Leu Ala Arg
            340                 345                 350
Gln Gly Val Val Val Val Thr Phe Asn Tyr Arg Thr Asn Ile Leu Gly
```

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```
        355                 360                 365
Phe Phe Ala His Pro Gly Leu Ser Arg Glu Ser Pro Thr Gly Thr Ser
    370                 375                 380
Gly Asn Tyr Gly Leu Leu Asp Ile Leu Ala Ala Leu Arg Trp Val Gln
385                 390                 395                 400
Ser Asn Ala Arg Ala Phe Gly Gly Asp Pro Gly Arg Val Thr Val Phe
                405                 410                 415
Gly Glu Ser Ala Gly Ala Ser Ala Ile Gly Leu Leu Leu Thr Ser Pro
            420                 425                 430
Leu Ser Lys Gly Leu Phe Arg Gly Ala Ile Leu Glu Ser Pro Gly Leu
        435                 440                 445
Thr Arg Pro Leu Ala Thr Leu Ala Asp Ser Ala Ala Ser Gly Glu Arg
    450                 455                 460
Leu Asp Ala Asp Leu Ser Arg Leu Arg Ser Thr Asp Pro Ala Thr Leu
465                 470                 475                 480
Met Ala Arg Ala Asp Ala Ala Arg Pro Ala Ser Arg Asp Leu Arg Arg
                485                 490                 495
Pro Arg Pro Thr Gly Pro Ile Val Asp Gly His Val Leu Pro Gln Thr
            500                 505                 510
Asp Ser Ala Ala Ile Ala Ala Gly Gln Leu Ala Pro Val Arg Val Leu
        515                 520                 525
Ile Gly Thr Asn Ala Asp Glu Gly Arg Ala Phe Leu Gly Arg Ala Pro
    530                 535                 540
Met Glu Thr Pro Ala Asp Tyr Gln Ala Tyr Leu Glu Ala Gln Phe Gly
545                 550                 555                 560
Asp Gln Ala Ala Ala Val Ala Ala Cys Tyr Pro Leu Asp Gly Arg Ala
                565                 570                 575
Thr Pro Lys Glu Met Val Ala Arg Ile Phe Gly Asp Asn Gln Phe Asn
            580                 585                 590
Arg Gly Val Ser Ala Phe Ser Glu Ala Leu Val Arg Gln Gly Ala Pro
        595                 600                 605
Val Trp Arg Tyr Gln Phe Asn Gly Asn Thr Glu Gly Gly Arg Ala Pro
    610                 615                 620
Ala Thr His Gly Ala Glu Ile Pro Tyr Val Phe Gly Val Phe Lys Leu
625                 630                 635                 640
Asp Glu Leu Gly Leu Phe Asp Trp Pro Pro Glu Gly Pro Thr Pro Ala
                645                 650                 655
Asp Arg Ala Leu Gly Gln Leu Met Ser Ser Ala Trp Val Arg Phe Ala
            660                 665                 670
Lys Asn Gly Asp Pro Ala Gly Asp Ala Leu Thr Trp Pro Ala Tyr Ser
        675                 680                 685
Thr Gly Lys Ser Thr Met Thr Phe Gly Pro Glu Gly Arg Ala Ala Val
    690                 695                 700
Val Ser Pro Gly Pro Ser Ile Pro Pro Cys Ala Asp Gly Ala Lys Ala
705                 710                 715                 720
Gly Gly Gly Gly Ser Gly Gly Gly Ser Gly Gly Gly Ser Lys Asp Asn
                725                 730                 735
Val Ala Asp Val Val Val Val Gly Ala Gly Leu Ser Gly Leu Glu Thr
            740                 745                 750
Ala Arg Lys Val Gln Ala Ala Gly Leu Ser Cys Leu Val Leu Glu Ala
        755                 760                 765
Met Asp Arg Val Gly Gly Lys Thr Leu Ser Val Gln Ser Gly Pro Gly
    770                 775                 780
Arg Thr Thr Ile Asn Asp Leu Gly Ala Ala Trp Ile Asn Asp Ser Asn
785                 790                 795                 800
Gln Ser Glu Val Ser Arg Leu Phe Glu Arg Phe His Leu Glu Gly Glu
                805                 810                 815
Leu Gln Arg Thr Thr Gly Asn Ser Ile His Gln Ala Gln Asp Gly Thr
            820                 825                 830
Thr Thr Thr Ala Pro Tyr Gly Asp Ser Leu Leu Ser Glu Glu Val Ala
        835                 840                 845
Ser Ala Leu Ala Glu Leu Leu Pro Val Trp Ser Gln Leu Ile Glu Glu
```

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    850                 855                 860
His Ser Leu Gln Asp Leu Lys Ala Ser Pro Gln Ala Lys Arg Leu Asp
865                 870                 875                 880
Ser Val Ser Phe Ala His Tyr Cys Glu Lys Glu Leu Asn Leu Pro Ala
                885                 890                 895
Val Leu Gly Val Ala Asn Gln Ile Thr Arg Ala Leu Leu Gly Val Glu
            900                 905                 910
Ala His Glu Ile Ser Met Leu Phe Leu Thr Asp Tyr Ile Lys Ser Ala
        915                 920                 925
Thr Gly Leu Ser Asn Ile Phe Ser Asp Lys Lys Asp Gly Gly Gln Tyr
    930                 935                 940
Met Arg Cys Lys Thr Gly Met Gln Ser Ile Cys His Ala Met Ser Lys
945                 950                 955                 960
Glu Leu Val Pro Gly Ser Val His Leu Asn Thr Pro Val Ala Glu Ile
                965                 970                 975
Glu Gln Ser Ala Ser Gly Cys Thr Val Arg Ser Ala Ser Gly Ala Val
            980                 985                 990
Phe Arg Ser Lys Lys Val Val Val Ser Leu Pro Thr Thr Leu Tyr Pro
        995                 1000                1005
Thr Leu Thr Phe Ser Pro Pro Leu Pro Ala Glu Lys Gln Ala Leu Ala
    1010                1015                1020
Glu Asn Ser Ile Leu Gly Tyr Tyr Ser Lys Ile Val Phe Val Trp Asp
1025                1030                1035                1040
Lys Pro Trp Trp Arg Glu Gln Gly Phe Ser Gly Val Leu Gln Ser Ser
                1045                1050                1055
Cys Asp Pro Ile Ser Phe Ala Arg Asp Thr Ser Ile Asp Val Asp Arg
            1060                1065                1070
Gln Trp Ser Ile Thr Cys Phe Met Val Gly Asp Pro Gly Arg Lys Trp
        1075                1080                1085
Ser Gln Gln Ser Lys Gln Val Arg Gln Lys Ser Val Trp Asp Gln Leu
    1090                1095                1100
Arg Ala Ala Tyr Glu Asn Ala Gly Ala Gln Val Pro Glu Pro Ala Asn
1105                1110                1115                1120
Val Leu Glu Ile Glu Trp Ser Lys Gln Gln Tyr Phe Gln Gly Ala Pro
                1125                1130                1135
Ser Ala Val Tyr Gly Leu Asn Asp Leu Ile Thr Leu Gly Ser Ala Leu
            1140                1145                1150
Arg Thr Pro Phe Lys Ser Val His Phe Val Gly Thr Glu Thr Ser Leu
        1155                1160                1165
Val Trp Lys Gly Tyr Met Glu Gly Ala Ile Arg Ser Gly Gln Arg Gly
    1170                1175                1180
Ala Ala Glu Val Val Ala Ser Leu Val Pro Ala Ala
1185                1190                1195
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<211> 2490
<212> DNA
<213> Unknown

<220>
<223> GST:glyc(-)APAO open reading frame, 2490 nt; GST and linker, nt 1-687; Glyc (-) APAO, nt 688-2490; mutation in putative glycosylation sites in bold and underlined, nt 1288-1290 (AAT->TCC) and nt 1303-1305 (AGC->AAC).

<221> CDS
<222> (1)...(2487)

<221> misc_feature
<222> (1)...(687)
<223> GST and linker

Document: 3654704

<221> misc_feature
<222> (688)...(2490)
<223> Glyc (-) APAO

<221> mutation
<222> (1288)...(1290)
<223> mutation in putative glycosylation site (AAT->TCC)

<221> mutation
<222> (1303)...(1305)
<223> mutation in putative glycosylation site (AGC->AAC)

<400> 32

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atg tcc cct ata cta ggt tat tgg aaa att aag ggc ctt gtg caa ccc       48
Met Ser Pro Ile Leu Gly Tyr Trp Lys Ile Lys Gly Leu Val Gln Pro
 1               5                  10                  15

act cga ctt ctt ttg gaa tat ctt gaa gaa aaa tat gaa gag cat ttg       96
Thr Arg Leu Leu Leu Glu Tyr Leu Glu Glu Lys Tyr Glu Glu His Leu
             20                  25                  30

tat gag cgc gat gaa ggt gat aaa tgg cga aac aaa aag ttt gaa ttg      144
Tyr Glu Arg Asp Glu Gly Asp Lys Trp Arg Asn Lys Lys Phe Glu Leu
         35                  40                  45

ggt ttg gag ttt ccc aat ctt cct tat tat att gat ggt gat gtt aaa      192
Gly Leu Glu Phe Pro Asn Leu Pro Tyr Tyr Ile Asp Gly Asp Val Lys
     50                  55                  60

tta aca cag tct atg gcc atc ata cgt tat ata gct gac aag cac aac      240
Leu Thr Gln Ser Met Ala Ile Ile Arg Tyr Ile Ala Asp Lys His Asn
 65                  70                  75                  80

atg ttg ggt ggt tgt cca aaa gag cgt gca gag att tca atg ctt gaa      288
Met Leu Gly Gly Cys Pro Lys Glu Arg Ala Glu Ile Ser Met Leu Glu
                 85                  90                  95

gga gcg gtt ttg gat att aga tac ggt gtt tcg aga att gca tat agt      336
Gly Ala Val Leu Asp Ile Arg Tyr Gly Val Ser Arg Ile Ala Tyr Ser
            100                 105                 110

aaa gac ttt gaa act ctc aaa gtt gat ttt ctt agc aag cta cct gaa      384
Lys Asp Phe Glu Thr Leu Lys Val Asp Phe Leu Ser Lys Leu Pro Glu
        115                 120                 125

atg ctg aaa atg ttc gaa gat cgt tta tgt cat aaa aca tat tta aat      432
Met Leu Lys Met Phe Glu Asp Arg Leu Cys His Lys Thr Tyr Leu Asn
    130                 135                 140

ggt gat cat gta acc cat cct gac ttc atg ttg tat gac gct ctt gat      480
Gly Asp His Val Thr His Pro Asp Phe Met Leu Tyr Asp Ala Leu Asp
145                 150                 155                 160

gtt gtt tta tac atg gac cca atg tgc ctg gat gcg ttc cca aaa tta      528
Val Val Leu Tyr Met Asp Pro Met Cys Leu Asp Ala Phe Pro Lys Leu
                165                 170                 175

gtt tgt ttt aaa aaa cgt att gaa gct atc cca caa att gat aag tac      576
Val Cys Phe Lys Lys Arg Ile Glu Ala Ile Pro Gln Ile Asp Lys Tyr
            180                 185                 190
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```
ttg aaa tcc agc aag tat ata gca tgg cct ttg cag ggc tgg caa gcc      624
Leu Lys Ser Ser Lys Tyr Ile Ala Trp Pro Leu Gln Gly Trp Gln Ala
        195                 200                 205

acg ttt ggt ggt ggc gac cat cct cca aaa tcg gat ctg gtt ccg cgt      672
Thr Phe Gly Gly Gly Asp His Pro Pro Lys Ser Asp Leu Val Pro Arg
    210                 215                 220

gga tcc ccg gaa ttc atg gca ctt gca ccg agc tac atc aat ccc cca      720
Gly Ser Pro Glu Phe Met Ala Leu Ala Pro Ser Tyr Ile Asn Pro Pro
225                 230                 235                 240

aac gtc gcc tcc cca gca ggg tat tct cac gtc ggc gta ggc cca gac      768
Asn Val Ala Ser Pro Ala Gly Tyr Ser His Val Gly Val Gly Pro Asp
                245                 250                 255

gga ggg agg tat gtg aca ata gct gga cag att gga caa gac gct tcg      816
Gly Gly Arg Tyr Val Thr Ile Ala Gly Gln Ile Gly Gln Asp Ala Ser
            260                 265                 270

ggc gtg aca gac cct gcc tac gag aaa cag gtt gcc caa gca ttc gcc      864
Gly Val Thr Asp Pro Ala Tyr Glu Lys Gln Val Ala Gln Ala Phe Ala
        275                 280                 285

aat ctg cga gct tgc ctt gct gca gtt gga gcc act tca aac gac gtc      912
Asn Leu Arg Ala Cys Leu Ala Ala Val Gly Ala Thr Ser Asn Asp Val
    290                 295                 300

acc aag ctc aat tac tac atc gtc gac tac gcc ccg agc aaa ctc acc      960
Thr Lys Leu Asn Tyr Tyr Ile Val Asp Tyr Ala Pro Ser Lys Leu Thr
305                 310                 315                 320

gca att gga gat ggg ctg aag gct acc ttt gcc ctt gac agg ctc cct     1008
Ala Ile Gly Asp Gly Leu Lys Ala Thr Phe Ala Leu Asp Arg Leu Pro
                325                 330                 335

cct tgc acg ctg gtg cca gtg tcg gcc ttg tct tca cct gaa tac ctc     1056
Pro Cys Thr Leu Val Pro Val Ser Ala Leu Ser Ser Pro Glu Tyr Leu
            340                 345                 350

ttt gag gtt gat gcc acg gcg ctg gtg ccg gga cac acg acc cca gac     1104
Phe Glu Val Asp Ala Thr Ala Leu Val Pro Gly His Thr Thr Pro Asp
        355                 360                 365

aac gtt gcg gac gtg gta gtg gtg ggc gct ggc ttg agc ggt ttg gag     1152
Asn Val Ala Asp Val Val Val Val Gly Ala Gly Leu Ser Gly Leu Glu
    370                 375                 380

acg gca cgc aaa gtc cag gcc gcc ggt ctg tcc tgc ctc gtt ctt gag     1200
Thr Ala Arg Lys Val Gln Ala Ala Gly Leu Ser Cys Leu Val Leu Glu
385                 390                 395                 400

gcg atg gat cgt gta ggg gga aag act ctg agc gta caa tcg ggt ccc     1248
Ala Met Asp Arg Val Gly Gly Lys Thr Leu Ser Val Gln Ser Gly Pro
                405                 410                 415

ggc agg acg act atc aac gac ctc ggc gct gcg tgg atc tcc gac agc     1296
Gly Arg Thr Thr Ile Asn Asp Leu Gly Ala Ala Trp Ile Ser Asp Ser
            420                 425                 430

aac caa aac gaa gta tcc aga ttg ttt gaa aga ttt cat ttg gag ggc     1344
Asn Gln Asn Glu Val Ser Arg Leu Phe Glu Arg Phe His Leu Glu Gly
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        435                 440                 445

gag ctc cag agg acg act gga aat tca atc cat caa gca caa gac ggt     1392
Glu Leu Gln Arg Thr Thr Gly Asn Ser Ile His Gln Ala Gln Asp Gly
    450                 455                 460

aca acc act aca gct cct tat ggt gac tcc ttg ctg agc gag gag gtt     1440
Thr Thr Thr Thr Ala Pro Tyr Gly Asp Ser Leu Leu Ser Glu Glu Val
465                 470                 475                 480

gca agt gca ctt gcg gaa ctc ctc ccc gta tgg tct cag ctg atc gaa     1488
Ala Ser Ala Leu Ala Glu Leu Leu Pro Val Trp Ser Gln Leu Ile Glu
                485                 490                 495

gag cat agc ctt caa gac ctc aag gcg agc cct cag gcg aag cgg ctc     1536
Glu His Ser Leu Gln Asp Leu Lys Ala Ser Pro Gln Ala Lys Arg Leu
            500                 505                 510

gac agt gtg agc ttc gcg cac tac tgt gag aag gaa cta aac ttg cct     1584
Asp Ser Val Ser Phe Ala His Tyr Cys Glu Lys Glu Leu Asn Leu Pro
        515                 520                 525

gct gtt ctc ggc gta gca aac cag atc aca cgc gct ctg ctc ggt gtg     1632
Ala Val Leu Gly Val Ala Asn Gln Ile Thr Arg Ala Leu Leu Gly Val
    530                 535                 540

gaa gcc cac gag atc agc atg ctt ttt ctc acc gac tac atc aag agt     1680
Glu Ala His Glu Ile Ser Met Leu Phe Leu Thr Asp Tyr Ile Lys Ser
545                 550                 555                 560

gcc acc ggt ctc agt aat att ttc tcg gac aag aaa gac ggc ggg cag     1728
Ala Thr Gly Leu Ser Asn Ile Phe Ser Asp Lys Lys Asp Gly Gly Gln
                565                 570                 575

tat atg cga tgc aaa aca ggt atg cag tcg att tgc cat gcc atg tca     1776
Tyr Met Arg Cys Lys Thr Gly Met Gln Ser Ile Cys His Ala Met Ser
            580                 585                 590

aag gaa ctt gtt cca ggc tca gtg cac ctc aac acc ccc gtc gct gaa     1824
Lys Glu Leu Val Pro Gly Ser Val His Leu Asn Thr Pro Val Ala Glu
        595                 600                 605

att gag cag tcg gca tcc ggc tgt aca gta cga tcg gcc tcg ggc gcc     1872
Ile Glu Gln Ser Ala Ser Gly Cys Thr Val Arg Ser Ala Ser Gly Ala
    610                 615                 620

gtg ttc cga agc aaa aag gtg gtg gtt tcg tta ccg aca acc ttg tat     1920
Val Phe Arg Ser Lys Lys Val Val Val Ser Leu Pro Thr Thr Leu Tyr
625                 630                 635                 640

ccc acc ttg aca ttt tca cca cct ctt ccc gcc gag aag caa gca ttg     1968
Pro Thr Leu Thr Phe Ser Pro Pro Leu Pro Ala Glu Lys Gln Ala Leu
                645                 650                 655

gcg gaa aat tct atc ctg ggc tac tat agc aag ata gtc ttc gta tgg     2016
Ala Glu Asn Ser Ile Leu Gly Tyr Tyr Ser Lys Ile Val Phe Val Trp
            660                 665                 670

gac aag ccg tgg tgg cgc gaa caa ggc ttc tcg ggc gtc ctc caa tcg     2064
Asp Lys Pro Trp Trp Arg Glu Gln Gly Phe Ser Gly Val Leu Gln Ser
        675                 680                 685
```

```
agc tgt gac ccc atc tca ttt gcc aga gat acc agc atc gac gtc gat     2112
Ser Cys Asp Pro Ile Ser Phe Ala Arg Asp Thr Ser Ile Asp Val Asp
    690                 695                 700

cga caa tgg tcc att acc tgt ttc atg gtc gga gac ccg gga cgg aag     2160
Arg Gln Trp Ser Ile Thr Cys Phe Met Val Gly Asp Pro Gly Arg Lys
705                 710                 715                 720

tgg tcc caa cag tcc aag cag gta cga caa aag tct gtc tgg gac caa     2208
Trp Ser Gln Gln Ser Lys Gln Val Arg Gln Lys Ser Val Trp Asp Gln
                725                 730                 735

ctc cgc gca gcc tac gag aac gcc ggg gcc caa gtc cca gag ccg gcc     2256
Leu Arg Ala Ala Tyr Glu Asn Ala Gly Ala Gln Val Pro Glu Pro Ala
            740                 745                 750

aac gtg ctc gaa atc gag tgg tcg aag cag cag tat ttc caa gga gct     2304
Asn Val Leu Glu Ile Glu Trp Ser Lys Gln Gln Tyr Phe Gln Gly Ala
        755                 760                 765

ccg agc gcc gtc tat ggg ctg aac gat ctc atc aca ctg ggt tcg gcg     2352
Pro Ser Ala Val Tyr Gly Leu Asn Asp Leu Ile Thr Leu Gly Ser Ala
    770                 775                 780

ctc aga acg ccg ttc aag agt gtt cat ttc gtt gga acg gag acg tct     2400
Leu Arg Thr Pro Phe Lys Ser Val His Phe Val Gly Thr Glu Thr Ser
785                 790                 795                 800

tta gtt tgg aaa ggg tat atg gaa ggg gcc ata cga tcg ggt caa cga     2448
Leu Val Trp Lys Gly Tyr Met Glu Gly Ala Ile Arg Ser Gly Gln Arg
                805                 810                 815

ggt gct gca gaa gtt gtg gct agc ctg gtg cca gca gca tag              2490
Gly Ala Ala Glu Val Val Ala Ser Leu Val Pro Ala Ala
            820                 825
```

Substitute Sheet (Rule 26)

<210> 33
<211> 829
<212> PRT
<213> Unknown

<400> 33

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Met Ser Pro Ile Leu Gly Tyr Trp Lys Ile Lys Gly Leu Val Gln Pro
 1               5                  10                  15
Thr Arg Leu Leu Leu Glu Tyr Leu Glu Glu Lys Tyr Glu Glu His Leu
            20                  25                  30
Tyr Glu Arg Asp Glu Gly Asp Lys Trp Arg Asn Lys Lys Phe Glu Leu
        35                  40                  45
Gly Leu Glu Phe Pro Asn Leu Pro Tyr Tyr Ile Asp Gly Asp Val Lys
    50                  55                  60
Leu Thr Gln Ser Met Ala Ile Ile Arg Tyr Ile Ala Asp Lys His Asn
65                  70                  75                  80
Met Leu Gly Gly Cys Pro Lys Glu Arg Ala Glu Ile Ser Met Leu Glu
                85                  90                  95
Gly Ala Val Leu Asp Ile Arg Tyr Gly Val Ser Arg Ile Ala Tyr Ser
            100                 105                 110
Lys Asp Phe Glu Thr Leu Lys Val Asp Phe Leu Ser Lys Leu Pro Glu
        115                 120                 125
Met Leu Lys Met Phe Glu Asp Arg Leu Cys His Lys Thr Tyr Leu Asn
    130                 135                 140
Gly Asp His Val Thr His Pro Asp Phe Met Leu Tyr Asp Ala Leu Asp
```

```
145                 150                 155                 160
Val Val Leu Tyr Met Asp Pro Met Cys Leu Asp Ala Phe Pro Lys Leu
                165                 170                 175
Val Cys Phe Lys Lys Arg Ile Glu Ala Ile Pro Gln Ile Asp Lys Tyr
            180                 185                 190
Leu Lys Ser Ser Lys Tyr Ile Ala Trp Pro Leu Gln Gly Trp Gln Ala
        195                 200                 205
Thr Phe Gly Gly Gly Asp His Pro Pro Lys Ser Asp Leu Val Pro Arg
    210                 215                 220
Gly Ser Pro Glu Phe Met Ala Leu Ala Pro Ser Tyr Ile Asn Pro Pro
225                 230                 235                 240
Asn Val Ala Ser Pro Ala Gly Tyr Ser His Val Gly Val Gly Pro Asp
                245                 250                 255
Gly Gly Arg Tyr Val Thr Ile Ala Gly Gln Ile Gly Gln Asp Ala Ser
            260                 265                 270
Gly Val Thr Asp Pro Ala Tyr Glu Lys Gln Val Ala Gln Ala Phe Ala
        275                 280                 285
Asn Leu Arg Ala Cys Leu Ala Ala Val Gly Ala Thr Ser Asn Asp Val
    290                 295                 300
Thr Lys Leu Asn Tyr Tyr Ile Val Asp Tyr Ala Pro Ser Lys Leu Thr
305                 310                 315                 320
Ala Ile Gly Asp Gly Leu Lys Ala Thr Phe Ala Leu Asp Arg Leu Pro
                325                 330                 335
Pro Cys Thr Leu Val Pro Val Ser Ala Leu Ser Ser Pro Glu Tyr Leu
            340                 345                 350
Phe Glu Val Asp Ala Thr Ala Leu Val Pro Gly His Thr Thr Pro Asp
        355                 360                 365
Asn Val Ala Asp Val Val Val Val Gly Ala Gly Leu Ser Gly Leu Glu
    370                 375                 380
Thr Ala Arg Lys Val Gln Ala Ala Gly Leu Ser Cys Leu Val Leu Glu
385                 390                 395                 400
Ala Met Asp Arg Val Gly Gly Lys Thr Leu Ser Val Gln Ser Gly Pro
                405                 410                 415
Gly Arg Thr Thr Ile Asn Asp Leu Gly Ala Ala Trp Ile Ser Asp Ser
            420                 425                 430
Asn Gln Asn Glu Val Ser Arg Leu Phe Glu Arg Phe His Leu Glu Gly
        435                 440                 445
Glu Leu Gln Arg Thr Thr Gly Asn Ser Ile His Gln Ala Gln Asp Gly
    450                 455                 460
Thr Thr Thr Thr Ala Pro Tyr Gly Asp Ser Leu Leu Ser Glu Glu Val
465                 470                 475                 480
Ala Ser Ala Leu Ala Glu Leu Leu Pro Val Trp Ser Gln Leu Ile Glu
                485                 490                 495
Glu His Ser Leu Gln Asp Leu Lys Ala Ser Pro Gln Ala Lys Arg Leu
            500                 505                 510
Asp Ser Val Ser Phe Ala His Tyr Cys Glu Lys Glu Leu Asn Leu Pro
        515                 520                 525
Ala Val Leu Gly Val Ala Asn Gln Ile Thr Arg Ala Leu Leu Gly Val
    530                 535                 540
Glu Ala His Glu Ile Ser Met Leu Phe Leu Thr Asp Tyr Ile Lys Ser
545                 550                 555                 560
Ala Thr Gly Leu Ser Asn Ile Phe Ser Asp Lys Lys Asp Gly Gly Gln
                565                 570                 575
Tyr Met Arg Cys Lys Thr Gly Met Gln Ser Ile Cys His Ala Met Ser
            580                 585                 590
Lys Glu Leu Val Pro Gly Ser Val His Leu Asn Thr Pro Val Ala Glu
        595                 600                 605
Ile Glu Gln Ser Ala Ser Gly Cys Thr Val Arg Ser Ala Ser Gly Ala
    610                 615                 620
Val Phe Arg Ser Lys Lys Val Val Val Ser Leu Pro Thr Thr Leu Tyr
625                 630                 635                 640
Pro Thr Leu Thr Phe Ser Pro Pro Leu Pro Ala Glu Lys Gln Ala Leu
```